— THE —

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LONDON, AUGUST 1, 1908.

ELECTRICAL TRANSMISSION OF POWER.

THE paper read at the Franco-British Exhibition on July 18th, by Mr. W. P. Durtnall, to the members of The Institute of Marine Engineers, deals with a question which has been brought before us not infrequently in our waking hours by enthusiastic electricians who have desired to harness the steamship to their own pet adaptation of energy, while in the night watches, evoked probably by the impressions conveyed by day, we have seen visions of vessels moving over the face of the waters without the familiar features which had ever appealed to us as inseparable from both, the majestic liner and the humble tramp. The inventions and discoveries of recent years have brought nearer the possibility of the observatory-controlled vessel, in constant communication with the director of her destiny, sitting at ease in his chair. The advances being made in the magnitude of electric generators for land installations of power plant, and the success which has been attained in running many large plants already established, justify the advocacy of electric power applied to marine propulsion, and discussion on the subject will be profitable, tending to familiarize those concerned with the idea, inducing consideration of the advantages and disadvantages of the various methods of steam generation as applied to marine work, with the possible transmission of power through the medium of electric current to the propeller shafting.

THE STATE AND MERCHANT SHIPPING IN GERMANY.

DURING the last few weeks some strange rumours in relation to the supposed action of the German Government in reference to the great steamship companies of Hamburg and Bremen has been agitating the Press of the Fatherland. That in Germany importance is attached to and encouragement, at all events of certain kinds, afforded to the mercantile marine beyond what it is with ourselves is sufficiently known to most of our readers. We know how Herr Ballin, of the Hamburg-American Line, and Dr. Wiegand, of the Nord Deutscher Lloyd, are the honoured friends and trusted advisers of the Kaiser himself. We have seen that personage present and enthusiastic at the launch, not merely of his own warships, but even at that of a great and fast mail steamer. We cannot forget how prompt recognition has been afforded to those officers, both of the navigating and engineering branches, who have displayed exceptional courage and resource under circumstances of unwonted difficulty. It is said that the great diplomatists of the Wilhelmstrasse find themselves sometimes in the position of agents to the great steamship lines when a concession is open to offer or when a foreign Government finds itself in the market with a big series of shipping contracts.

The reports of most steamship companies for the working of the year 1907 are now published, and it is recognised that last year was a bad—almost in some cases a disastrous—period, and that even the biggest companies felt the pinch of bad times. So far 1908 has not shown much promise of any amendment on the fortunes of its predecessor, and it may well be understood that anxiety as to the fortunes of the large companies is beginning to be felt. The Germans know that steamship companies, directly and indirectly, find employment for many worthy and hard-working citizens of all ranks of society, besides conferring national benefit by the duties they perform in affording facilities for international intercourse. But we can hardly suppose that the State ever seriously contemplated the purchase of the Hamburg-American and Nord Deutscher Lloyd Companies. Much of their flexibility and usefulness would be gone if once they were nationalized, and the wise heads which direct public affairs in Germany must undoubtedly be cognizant of this fact. Then comes the equally improbable story that a State loan has to be raised to assist these companies to pay for the new tonnage which is being built. Of course denial met this story also, and indeed there are inherent improbabilities in it. The directors of such companies as those which we have named, are men of affairs and resource, accustomed to huge financial operations and to the happening of the unexpected. But nothing really unexpected has happened to warrant the suggestion that such a course as has been mentioned will be pursued. Times may be bad, but we have neither panic nor acute financial trouble. The depression which exists may cut somewhat into shipowners' profits in the immediate future, but no one will say that it is sufficiently serious to have crippled for a few hundreds of thousands of pounds such great undertakings as the Hamburg or Lloyd Companies, who must assuredly have known that the needful funds would in due time be forthcoming in any probable state of things ere ever they placed their orders for this new tonnage.

Herr Ballin, however, takes this opportunity to decry subvention to shipping and to make some sort of a suggestion as to desirability of having an International Conference to abolish such things. There is little fear of such a conference being summoned, and still less of its ever pretending to agree to such drastic measures, but let us look at the matter in a sensible way. Herr Ballin has often boasted that his line is run without any assistance. No doubt the statement he makes is literally true. But nevertheless we have no doubt that the Hamburg Line gets considerable

aid from the German Government; apart from the influence of the Berlin Foreign Office, the great steamship company benefits from the existence of the through freights which prevail between German inland cities and foreign ports. It gains also by the remission of taxes in certain cases. State aid can also be rendered through the necessary payments which the National Post Office make to its Mail Lines for the transit of its mails. These payments cannot be absolutely hidden, for they are for work done and services rendered. Yet if they are calculated in too liberal a spirit it is certain that they become assistance. The truth, we take it, is that Herr Ballin is troubled because the *Lusitania* and *Mauretania* have wrested the blue riband from their German friends and he would like to see the Cunard Company lessen its coal bill and run the vessels at 23 knots. He knows, too, that without aid it was impossible for a company, however rich, to build fast vessels of the class which will be needed to win the record from the two great Cunarders. He might, therefore, possibly find it useful to take the line he is doing in order that he may make sure of State aid when occasion arises. But he may rest assured that subventions of the open or the indirect type will not be abolished in our time.

TRANSPORT SERVICE.—The Admiralty transport service arrangements for the movements of troops during the coming season, commencing in September, have been announced, and from among the steamers that have been offered the following have been accepted:—*Dongola*, *Braemar Castle*, *Plassy*, *Rewa*, *Rohilla* and *Soudan*. The outfitting of these is now underway and the scene on board the first one to sail is a busy one. During the last twenty years considerable improvement has been made in the general arrangements necessary for the transport of large bodies of soldiers, and the systematic way in which the work is laid down and carried out proves the efficiency of the organizing staff to whom is entrusted the duty of seeing that the steamers are not only suitable for the work, but that all the details for the comfort and convenience of the men, women and children are carefully attended to; indeed, a modern transport completed ready for sea is a sight well worth seeing on inspection day when all the tables and seats with the mess utensils are on view; the baggage rooms and racks, the wash-houses, galleys, hospital, women's quarters, bathrooms and lavatories, and all the other fittings—even to the prison cell—which go to complete the equipment. We have turned from such a sight to a picture of some of the transports of fifty years ago, and the contrast is very great. From the light of the past to that of the present is itself a change as great as any; the oil lamp with its dingy flicker and its element of danger has given place to the full flare of the electric light. The low 'tween decks and the ill-ventilated quarters of bygone days make one shudder in view of the lofty and ample accommodation, with every attention to fresh air and a liberal allowance of appliances for expelling the vitiated atmosphere from stagnant corners now provided. The crude appliances for provisioning the men and setting the food before them has given place to a cleanly and systematic method of feeding, while the sleeping quarters are equally beyond comparison with those of the past. To Captain Maturin and his staff are due both credit and praise for the excellence of the arrangements in every detail—all carefully planned and carried out under their careful supervision by an army of shipwrights, joiners, plumbers, coppersmiths, fitters, electricians and other tradesmen. The sailing dates for the transports are as follows from Southampton, *Rohilla* (Indian), Sept. 4th; *Soudan* (Imperial), Sept. 16th; *Dongola* (Indian), Sept. 17th; *Braemar Castle* (Imperial), Sept. 24th; *Plassy* (Indian), Sept. 30th; *Rewa* (Indian), Oct. 16th.

NATIONAL SYSTEM OF HOME DEFENCE.—It would appear that the new scheme in connection with the Home Defence Force is lacking in some respects, in that it has not appealed, to the extent expected, to those sections of the community whence the Territorial Army should be recruited. Some enthusiasm has been created among the juniors in the schools and the Boys' Brigades, and from such the transition should be made easy and natural to the Territorials. The misconceptions and misunderstandings which seem to exist should be cleared away and more encouragement given to those who ought to come forward voluntarily, whole-heartedly and spontaneously, as well as from a sense of duty to the State, to hearth and home. There is no question as to the desirability and importance of encouraging by all means the young men of the nation in every rank of life to bear the yoke in their youth, to undergo discipline and physical training, as such tends to stiffen the moral backbone and sense of fairness. The junior engineer who has undergone physical training and drill is all the better for such, as when he enters the engine-room he falls more readily into the discipline which is necessary in all well-appointed steamers. The ambulance drill which it has been deemed advisable to introduce into the mercantile marine is excellent for both deck and engine departments, and those who have had some previous training and discipline will be more inclined to appreciate the value of such a course, and be all the more ready to take advantage of the opportunities afforded of learning the methods of action in dealing with accidents or wounded comrades. The Japanese Association for the Promotion of Physical Culture in its publications sets forth propositions and regulations which contain wholesome advice and quaint sayings which are well worthy of study, and are illustrative of the incentives used by the leaders of that enterprising people to keep alive patriotism and promote the well-being of the race, individually and collectively. It has been remarked that they are as a rule small of stature and cannot afford to let slip any opportunity of keeping up the standard or of developing it; this argument holds good for all nations, as they who neglect to take advantage of opportunities run the risk of having these taken away from them. We are indebted to the Editor of the Dollar Magazine and Miss Christie, of Cowden, who contributed an article to the June issue, for the following extracts from the booklet issued by the League of Martial Virtue in Japan. The preface issued by the founders reads—" We wish to put into practice that branch of education pertaining to military art, and convince the people of its necessity as well as of the harmful result of mental education crammed into a weak body. However, the military training should not be confined to merely exercising the bodily organs, but it should have a nobler object in view. It is to develop animal courage into its fullest perfection. It teaches the man how to train his spirit, wakes up his consciousness to what is wrong or mean, puts him in the path of generosity, and makes him ready for action and even defy death in time of national danger." These words are pregnant of wisdom; there are several other paragraphs containing germs of a good ground-work for consideration, some expressed with a quaintness which helps to rivet attention to them and induces thought. We are tempted to add another quotation from such a paragraph. " To be aware of the sacred relation of the people to the Imperial family, to share the responsibility of national defence, to be civil and courteous, to be honest and manly, to be diligent in one's occupation, and simple and frugal in habit so as to be able to turn his surplus for public good, to practise in military arts, to nourish healthy spirit and increase muscular power, to be a model of the people in his daily life, to sacrifice himself for his nation in time of national danger." There are paragraphs dealing specially with target shooting, horsemanship, bayonet practice, fencing, ju-jitsu, swimming, rowing, archery, etc. The pamphlet forms interesting reading and the tenets laid down are equally applicable to Western and Eastern nations.

WILLIAM McGEOCH & CO., LTD., have removed from 11, Charing Cross Road, to 90, Charing Cross Road, London, W.C. In their new premises, they have greater office and display accommodation, and they will be able to handle a larger volume of business.

THE GENERATION AND ELECTRICAL TRANSMISSION OF POWER FOR MAIN MARINE PROPULSION AND SPEED REGULATION.*

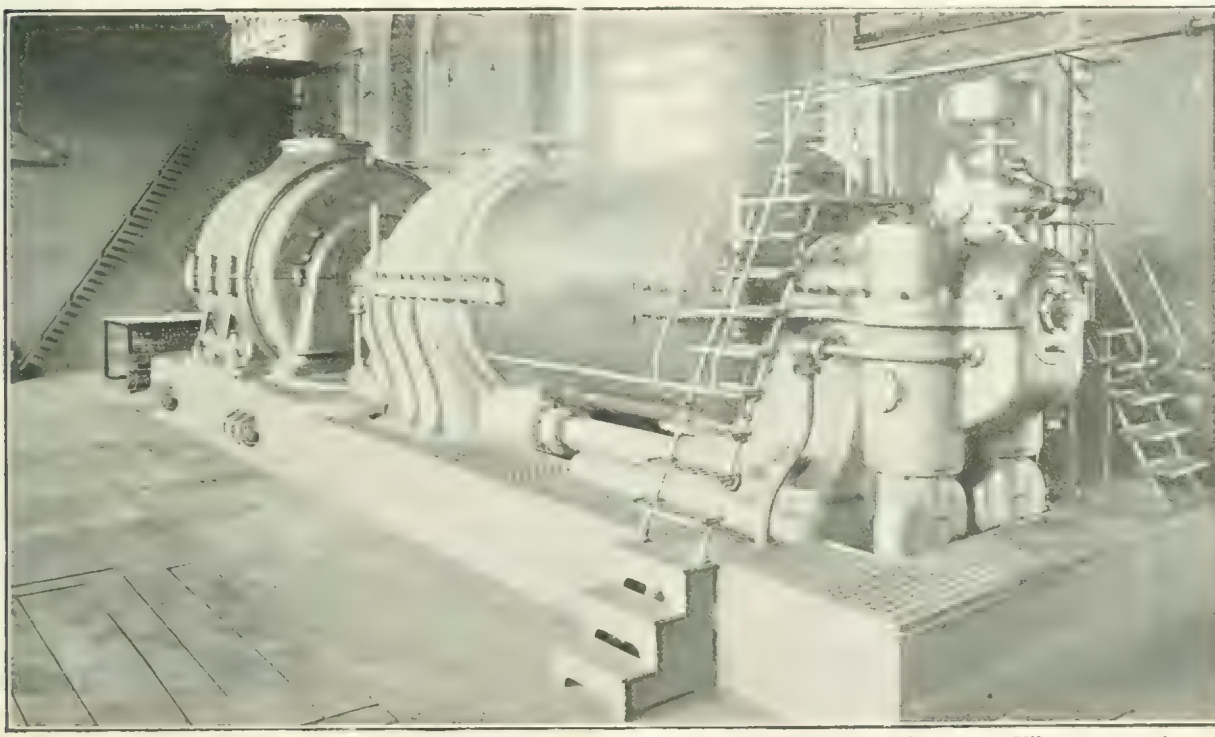
By Mr. William P. Durtnall (Member).

Few of the subjects which are to-day engaging the attention of the engineering world are comparable, either in scientific interest or in practical importance, commercially, with the generation and transmission of power for marine propulsion.

To design and construct a modern vessel which shall afford wholesome living accommodation and also provide sufficient warehouse room for merchandise, to be capable of propulsion from place to place at a given speed, and to be as safe against the perils of accident and tempest as human foresight can make it, is a problem which, if there was no experience to guide, would probably present as great difficulties and complexities as any one would care to attack; such, with the experience of the past to guide him, is the work of the naval architect. Next to this the first object aimed at is to propel a floating body through water at a certain speed, the second is to construct the propelling apparatus that the motion may be readily reversed or reduced in speed, and the third to adopt such an arrangement of propellers and motive power as shall be convenient for disposal in the floating body for the economical working of the same in service conditions, and such comes within the sphere and work of the marine engineer. Since about sixty-four years ago, when the first screw-propelled vessel crossed the Atlantic, a vast improvement has taken place in this method of propulsion, and all along this line of progress has seen the development of improved mechanical engineering, and some very beautiful pieces of ingenuity have been devised and put to work with well-known results, as witnessed by the change from the engines of the *Great Britain*, consisting as they did of two cylinders, each 88 ins. diameter and 72 ins. stroke; working at a steam pressure of 6 lb. per sq. in., they ran at 18 R.P.M., and drove by means of chain gear of 3 to 1 ratio, a six-bladed propeller at 54 R.P.M., and took about fifteen days to cross from Liverpool to New York.

Since that time have been introduced a large number of designs of steam marine engines, including the application of compound, triple and quadruple-expansion engines, and now we may add turbines.

Deep and scientific investigation has taken place as regards that interesting piece of apparatus, the screw propeller, when working under various conditions, but although many formulæ for finding the power necessary for a given vessel speed have been produced, these formulæ are of little real value unless the designer knows all the data of ships of similar form, size and speed.



A 12,000 H P Steam Turbo-Alternator 750 R.P.M., total weight of Generator, 73½ tons, about 7500 Kilo-watt capacity, steam consumption 13 86 lbs. per Kilo-watt hour.

But by the advent of the practical application of the marine steam turbine by Mr. Parsons, and also that splendid and clever piece of apparatus, the torsion meter by Messrs. Denny, accurate measurement can now be taken of steam used, and horse-power developed at the propeller, and doubtless a still closer investigation will now be made and the generally improved design of propellers will follow the actual tests which under real service conditions can now take place, and the object of this paper is to bring before the Institute the great possibilities of electrical power transmission and speed regulation as applied to steam-propelled vessels, when looked at also from the commercial aspect, and especially to point out the low operating cost that is possible, and to promote a good mutual discussion, which may serve to show the electrical transmission of power for marine work to be quite within the range of possibility.

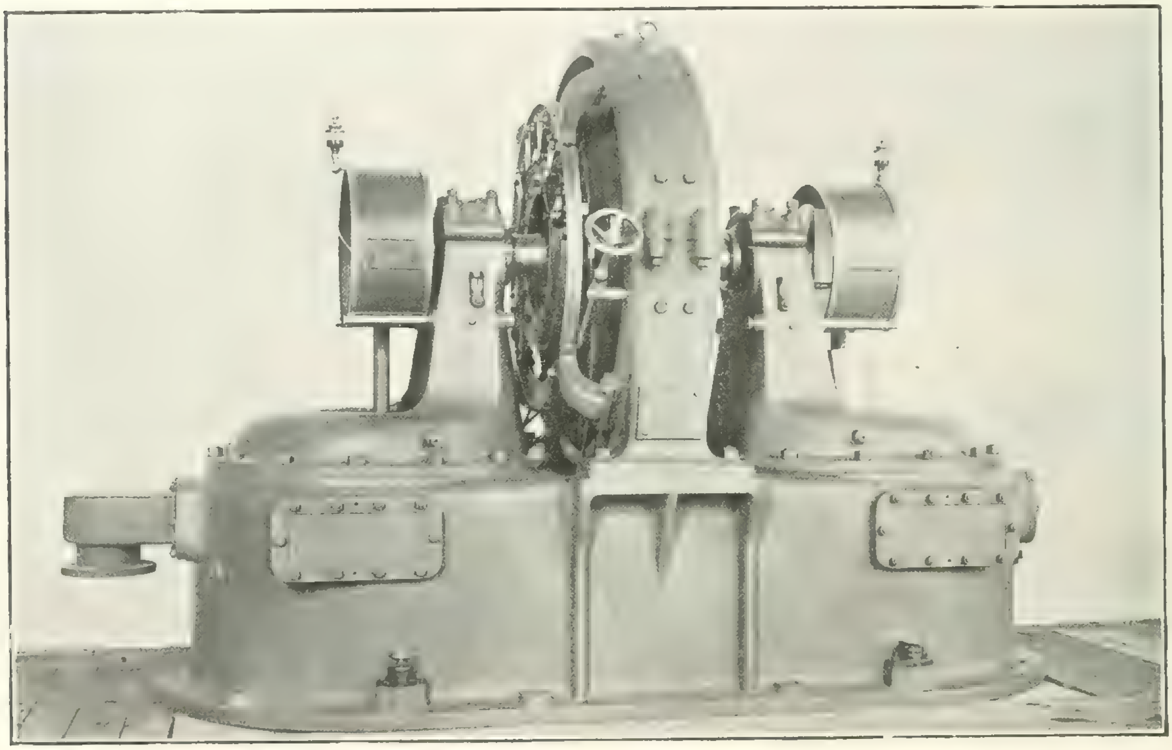
Generation of Power.—Steam still holds the leading position as the working fluid in heat engines, therefore its economical generation is of the highest importance and the construction of boilers is a study for all engineers.

* Read in The Congress Hall, Franco-British Exhibition, on Saturday, July 18, at 7.30 p.m. Chairman, Mr. Alexander Boyle (Vice-President Inst. Mar. Engrs.).

The question as to what type of boiler is most suitable for marine work is and has been a very disputed one, and different engineers still hold very divided opinions on this subject. No decision can, however, be arrived at on this point without a clear knowledge of the conditions under which the boilers have to work, and also the total amount of power that has to be provided. Some of the important points called for, however, are simplicity of construction, supply of dry steam, rapidity of raising steam, and capability of over-working, or being forced for short or reasonable periods, and last, but not least, light weight. Although the cylindrical marine type of boiler has done, and is still doing, good work, there is no doubt that on account of unequal heating effects, causing racking strains, and inefficient heating caused by unbroken masses of hot gases, lack of circulation, its great bulk and weight will in the end tell against its extensive use in future in these days of keen competition and low freight rates; and those owners who would desire to cut down working expenses would do well to look further into the merits of water tube and other efficient steam generators for use in the mercantile marine service. In large electricity supply stations on land most successful application has been made of these improvements in boiler-house equipments. Oil fuel will no doubt in the end find its own ground, and some of the features that strike one most forcibly in connection with this fuel are the absence of dirt and cinders, considerable saving in stoke-hold staff, the moving of the fuel can be carried out by pumps and pipes, instead of by stokers and trimmers, etc., and the absolute control of the heat that can be arranged, and many other commercially good points. Some very remarkable tests have recently been carried out with the application of oil fuel on the two sister French battleships, *The Patrie* and *The Justice*, each of 18,500 H.P., using large tube Niclausse water-tube boilers. The tests were carried out in very boisterous weather and showed conclusively that, when necessary, boilers may be forced above their normal working conditions with oil fuel, a virtue that is a desirable thing to have, although possibly not always taken advantage of under the normal steaming conditions.

Prime Movers.—There is no doubt that until a satisfactory internal-combustion engine, of comparative large power, is produced that the steam turbine will remain as a simple, light, small and efficient prime mover, and to be so, it must of a natural necessity run with a good condensing plant and at high speed. During the last twenty years the steam turbine has been developed in various forms and applied on a large scale to the generation of power, for electricity supply, marine propulsion and other purposes. The turbine is in several ways an almost ideal motor; it is easy to open up and repair, and is especially suitable for use with high superheated steam, owing to its practical freedom from distortion, etc., of its few working parts, and to the conspicuous absence of lubricated surfaces exposed, it gives a uniform torque, and is, at least in some cases, highly efficient under great variation of load, as witnessed by its successful application in important generating stations, working with tremendous loads, for railway and electric lighting service.

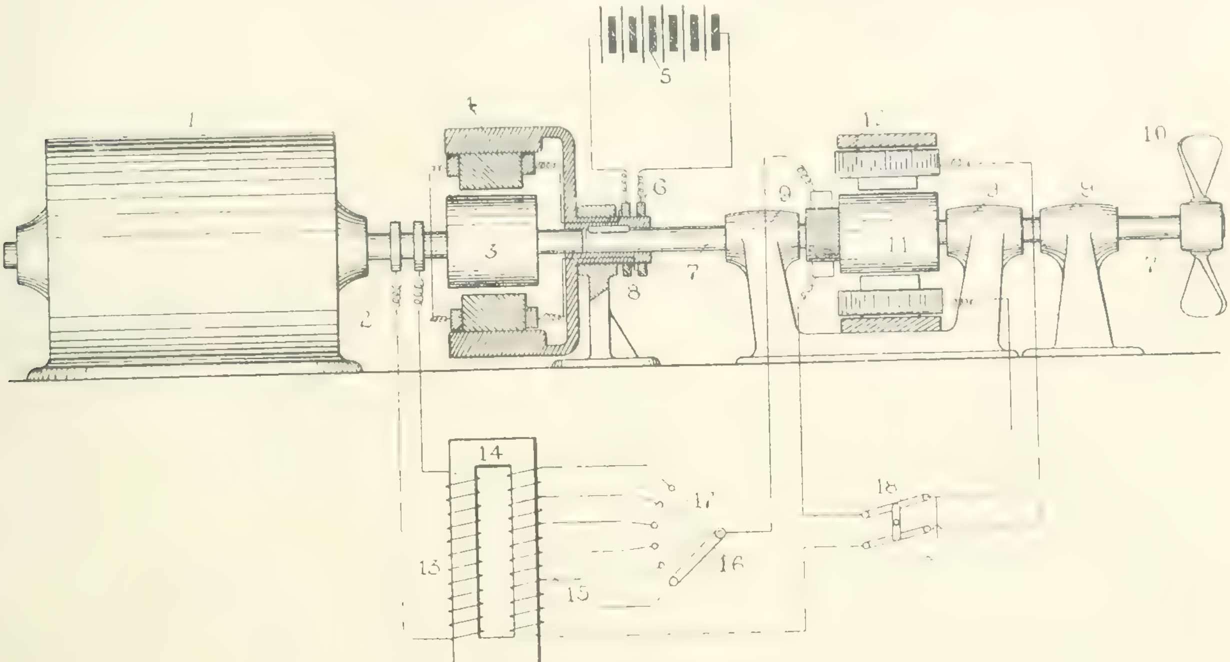
Its direct application for marine propulsion has secured a very strong hold, but in this case it labours under a few, but important, disadvantages, firstly, having to be direct coupled to the propeller, it has to be designed to run at very low speed in order to permit of the use of a propeller of high propulsive efficiency, consequently the weight per B.H.P. developed is increased to a very large extent, and owing to large diameter of rotor and casing, proportionately large blade clearance must be allowed in order to meet the conditions of expansion and contraction, etc., with consequent higher steam leakage and consumption per horse power of work developed; and another disadvantage of this application is the difficulty of reversing for manœuvring and going astern, and under those conditions it is not economical in steam, when working below full load and speed (in the tests of the *Lusitania*, steam used by the turbines only, including auxiliaries, was at 25·4 knots, 14·46 lbs. and at 15·77 knots, 26·53 lbs. of steam per shaft H.P.); this inconvenience although of perhaps little importance with steamships making long continuous runs, is very important for those making short voyages, starting and stopping and manœuvring in and out of harbour several times a day, or for ships of war, in battle or manœuvring in squadrons, and in order to get these very necessary qualities, separate astern turbines have to be installed and



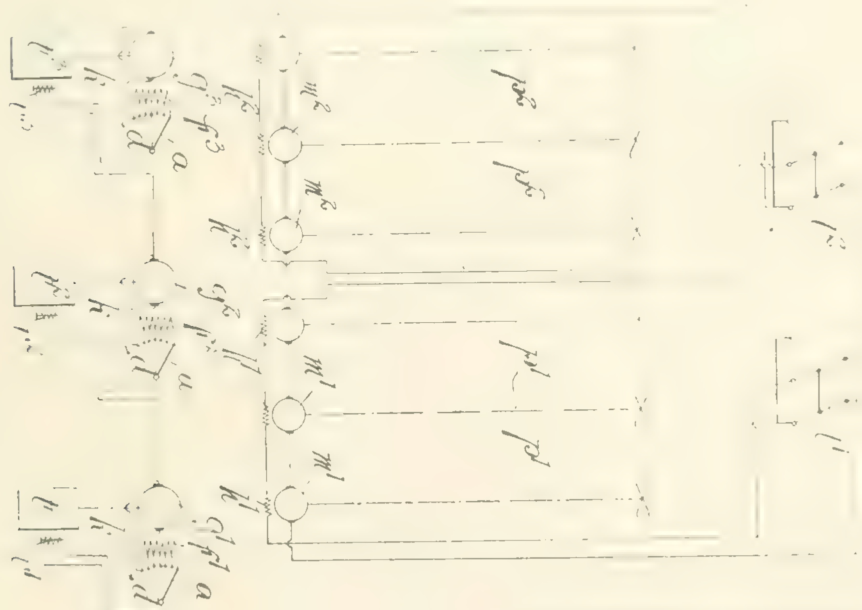
Motor-driven Air Pump for 7500 Kilo-watt Turbo-Alternator.

carried, but with only generally about one-third the ahead power, and these usually only applied to two out of three or four shafts as the case may be.

Such an arrangement cannot be looked on as very satisfactory, as part of the machinery is always running idle in either direction and dead weight is therefore considerable for that reason alone—and furthermore a full power speed is not possible at reverse, and the reverse turbines are generally driven ships, on short voyages, lose in landing most of the time gained by increased speed in the passage. It will, therefore, become quite evident that in order to secure the future complete success of the steam turbine as used for ship propulsion some means must be provided to allow the turbine to run at high speed, and the propellers at comparatively low speed, and so secure economy in both cases, and also to provide reverse motion for all shafts.



An American Electrical Marine Propulsion System, using single phase Alternative Current Machines.



HART-DURTNALL continuous current System, where six propellers are proposed, this is only used for small powers.

not so economical as the ahead turbines when running under work, as regards steam used per B.H.P. of work done, so that in order to get full power and speed astern, it would be necessary to install a duplicate set of turbines; obviously the weight would be increased, but even then safety would be of possibly more importance than the increased weight. It has been stated that as at present arranged the steam turbine-

Mechanical Gear.—This has been tried in connection with small power turbines, but the results, generally speaking, have been far from satisfactory, on account of the great noise and heavy cost of up-keep; the power transmission of the gear would possibly be high, but the noise would be insupportable, and the up-keep abnormally high, owing to fractured bearings and gear wheels, etc., and complication would probably arise

when dealing with large powers, owing to making the necessary provision for reverse motion, and propeller speed regulation.

Hydraulic Gear.—This would be of possible interest, but it is questionable if reasonable efficiency could be secured and vibration avoided, and owing to sliding parts, etc., wear and tear would in very large powers become very pronounced.

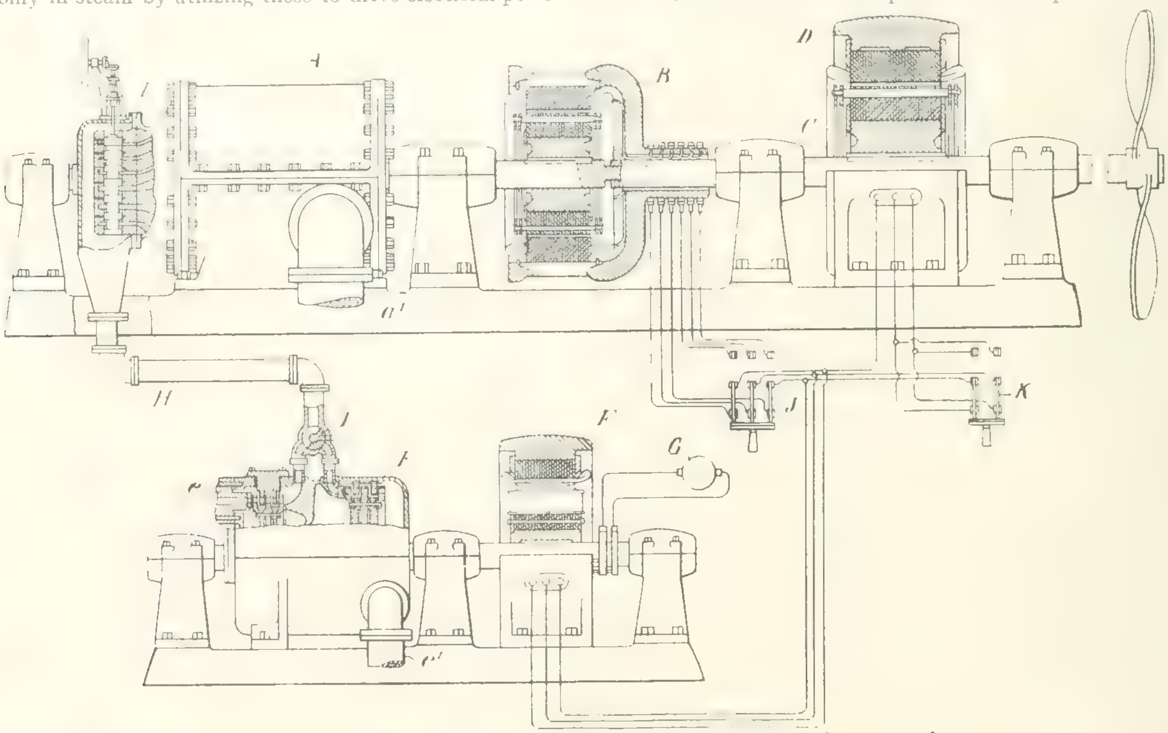
Compressed Air.—Although this method of power transmission has been extensively tried in small powers, it involves apparatus of such large dimensions that it would require the space of ordinary reciprocating engines to utilize the energy for driving propellers at low speeds, and for that reason alone could not be considered a practical solution, and furthermore either of the last two methods would not secure the utmost propulsive efficiency for a given amount of steam power, especially in rough weather.

Electrical Power Transmission.—This method seems to be the one in which the greatest possibilities lie; it has been proved by extensive practice that electrical power transmission has no successful competitor commercially, even over very long distance; and by its means we can get the very thing that is wanted for marine propulsion, the very elements that are required in order to take advantage of high-speed turbines, thus saving turbine weight and also securing high economy in steam by utilizing these to drive electrical power evident to the most sceptical, and pleasing to the sympathetic expert.

Owing to the very fine control which is possible, advantage can be taken of complete operation from the bridge, or other suitable position, by means of motor-operated switches; the large power conductors need only be broken, as when under no voltage conditions, and can be of the very simplest design, although controlling such large powers as will be met with in electrical marine engineering, and there are many points of real interest which have possibly been hitherto unlooked for.

I might here say that this important scheme has been partly discussed and criticised at various times recently, and that several dissenting opinions of considerable weight have been expressed in electrical engineering circles where the marine engineering side has not been thoroughly understood, and also in marine engineering circles where the electrical proposition has not been properly grasped; nevertheless it is with absolute confidence that I bring this matter more closely before you for deeper discussion and we shall probably soon have the opportunity of seeing in how far this confidence is justified.

In the creation of an absolutely new system of marine power transmission such as we are considering, the first question that arises is, of course, as to its practicability, that is to say, will the devices used accomplish what is expected of them,



An American System in which a Synchronous Generator is proposed.

generators. The current so generated can be used to supply low-speed electric motors, coupled to suitable propellers, which can be so calculated as regards power and speed that high efficiency can be secured by use of moderate speed large-bladed propellers. Further, this method of power transmission does not necessitate the cost of installation or operation of reverse turbines, as although the generators and turbines, fitted as prime movers, would run always in the same direction as regards speed rotation, the electric motor possesses the very thing that is required, namely, that it will do its work equally well, and has the most interesting characteristic that it can be efficiently run, in either direction, and the speed and direction can be instantly changed to suit all conditions met in practice, and this very important feature can be utilized with the utmost economy even at the very lowest speeds and powers.

Most engineers are well aware that the electric motor is a very flexible and efficient machine, and has the important quality, like the steam turbine, that it can stand a very severe overload for short periods without damage. The importance of this feature will appear more prominently later and this very feature for marine propulsion in rough weather will be and will they do it properly? This question has happily been settled some time now, and it is a thing not now to be queried; the practical commercial success of the very large electrical power transmission plants that are operating continuosuly in all parts of the world are sufficient to justify the answer.

The next and all-governing question arising is that of economy, formulated into the old, old question—will it pay? The answer to this was at first considered only from the somewhat narrow standpoint of comparing the efficiency, weight and cost of the shaft from the prime mover to the propeller, and from that aspect alone, electrical or any other media of power transmission cannot compete successfully with the straight-through mechanical drive; but however pleasing that may appear to the mechanical engineer it is not the owner's or the manager's point of view. Their view generally takes the line of "what does it cost to carry passengers or freight a given distance?" and when looked at from such broad views, it is quite an interesting question as to whether we are, with the present methods, utilizing both coal and material to the best advantage. It might be here pointed out that the electrical power transmission proposition brings the simple and reliable steam turbine within the practical

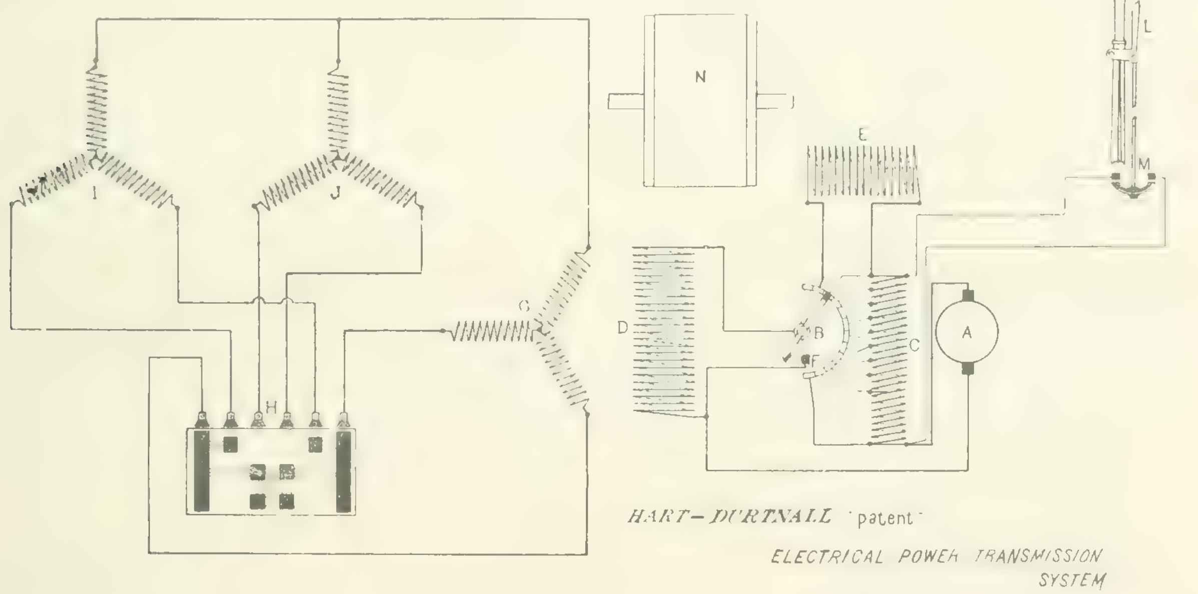
[illegible] combined passenger and cargo steamers, as well as slow [illegible]

[illegible] electrical machinery for power transmission may not be everyday practice with all members, I will briefly describe and illustrate some latest applications, and may state that, after the very closest investigation, it is my opinion that for marine propulsion, electrical power transmission can be only successfully carried out by means of polyphase alternating currents with synchronous generators, and squirrel cage induction motors, not only on account of the great simplicity of these machines, but on account of their low cost, and low weight per horse-power developed, but also considering the immense power to be handled, it is my opinion that as to continuous current and other forms of machines embodying the use of commutators and brush-gear, their use would be a matter practically of impossibility, besides such complications would not secure the low cost of maintenance which is absolutely necessary. It has been suggested to utilize a synchronous type of turbo-generator, with squirrel cage type of motor, which are no doubt very easy and suitable for parallel running, without synchronizing gear, and absence of rubbing contacts. But they are expensive, and less efficient, partly owing to large exciting current, and these machines are very rarely used in good practice.

volving parts of the alternator, and is small as compared with the total output of the generator, usually about 2 per cent., but varies according to circumstances. It is, however, of important interest to note their exceptionally high efficiency as converters of mechanical into electrical energy which varies from small sizes, such as are used in factories, to large sizes, such as are used in railway traction generating stations, from 85 per cent. to 98 per cent., and their weights per kilo-watt output for continuous rating, between 35 and 22 lbs. according to speed and other circumstances, while the steam consumption per kilo-watt hour in 7,500 kilo-watt sizes at, say, 750 R.P.M., running condensing and at 160 lbs. steam pressure, with 150 degrees superheat at the stop valve, and about 27½ in. vacuum, is about 13·5 to 14 lbs. (including auxiliary plant), while a 2,000 kilo-watt set running at 1,500 R.P.M. under similar circumstances consumes about 15·5, and it is also interesting to note that a 500 kilo-watt set at 3,000 R.P.M., uses only 23 lbs. of steam per kilo-watt.

For generators of equal output the high-speed steam turbine driven, low periodicity type is best as regards ease of design, low weight and initial cost, as well as requiring much lighter foundations, with consequent less initial cost in fitting and, what is most important, considerable less head-room and floor space and proper parallel running.

Satisfactory continuous current turbo-generators can only be constructed in comparatively small sizes, and even then



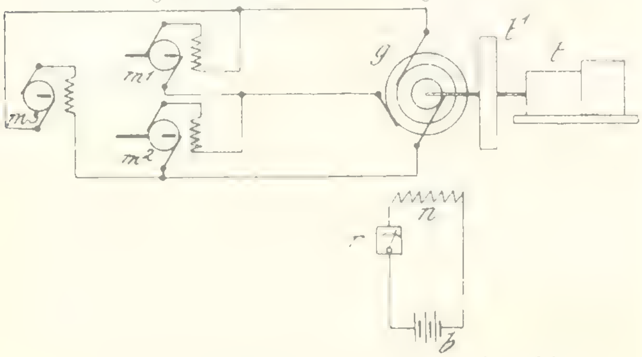
The HART-DURTNALL Polyphase Alternating Current System as applied to Marine Propulsion in conjunction with Internal Combustion Engines, so as to provide a Reverse and Three-Ahead Speeds, control from Bridge

In the polyphase system, with revolving field alternators, we have all those valuable features which are required for marine purposes, and that is what we will now deal with. In this type of alternator, the armature is stationary, and the armature windings are arranged in slots on the inner face of the armature structure, the latter forming a closed ring inside of which the multipolar field magnet revolves. The armature structure consists of an external frame of cast steel supported on a bedplate, the core consists of a ring, built up of relatively small stampings of sheet iron, dovetailed into the external frame and pressed together between two flanges by hydraulic means and bolts. The external frame in this type of alternator does not to any perceptible extent carry lines of force, that is to say, it does not form part of the magnetic circuit, but serves only as a support for the laminated armature core. By this construction it will be observed that as the main current is generated it can be taken right off from the stationary winding. The revolving field is constructed by a cast steel centre, forming the yoke of a, say, 4-pole magnet, on which are fixed the exciting coils, and these are connected to slip-rings, which receive the exciting current from a small direct current dynamo, the armature of which is generally mounted on the end of the main shaft. The current which this [illegible] supplies is the only amount that is used by the [illegible]

have recourse to either commutating poles, or compensating windings, preferably the latter, as these prevent field distortion, and consequent flashing over, of high voltage current, from brush to brush, and this type of generator is not to be looked on as a suitable machine for the purpose of providing current for main marine propulsion, as compared with the previous type of generator.

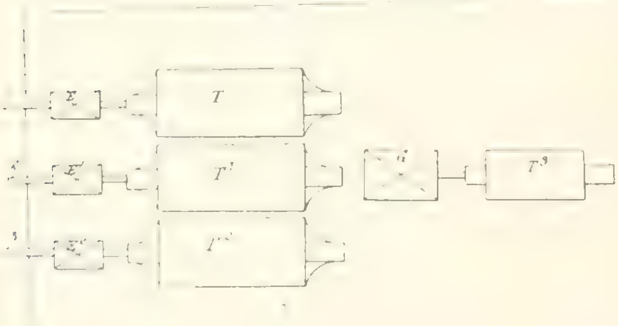
As regards the three-phase alternating current induction-motor this has become very popular in recent years, mainly owing to its powerful starting torque, light weight, and its freedom from commutators and brush-gear; a burnt-out armature, the perpetual source of dread in electric motor operation or practice, is practically unknown in this type of machine, even when put to very severe service; indeed, its depreciation under fair conditions is as low as in any other type of mechanical revolving machinery, and owing to its peculiar running characteristics it is especially suitable for marine propulsion work. It is very compact, and is noted for durability and simplicity; it also has the important qualification of low cost of structure, combined with great mechanical strength. The absence of commutators and brush-gear is an immense advantage, and as there is therefore no sparking limit, as in other forms of motors, the consequence is that the output per unit [illegible] much greater in large size polyphase induction [illegible]

motors, than in, say, a direct current machine; it is quite within the range of possibility to design and construct these motors for marine work of from 1,000 to 10,000 horse-power, which would weigh from 35 to 20 lbs. per horse-power developed, and this for continuous rating, and without sacrifice of any efficiency, which would in these cases be about 93 to 97 per cent. It is also interesting to note that unless considerably overloaded, an induction motor will run quite cool compared with other motors of the same weight and output; this is to a great extent due to the large section that can be



A German System of Electrical Marine Propulsion, with Single Phase Commutator Motors.

given to the windings, whilst the laminated character of the iron facilitates ventilation. Although polyphase induction motors are termed non-synchronous it should be borne in mind that there is always a tendency towards synchronism. The speed of an induction motor is, in fact, almost independent of the load, the variation in speed of squirrel cage motors, from no-load to full-load, seldom exceeds even in small sizes 5 per cent., and in larger sizes would probably not exceed 1 per cent. Generally speaking it is not too much to say that while the commutator motor will always be an electrical apparatus requiring more or less skilled attention (especially in large units), the polyphase squirrel cage induction motor, being without brush-gear or commutators, etc., can practically be termed a piece of mechanical machinery requiring no skilled and very little unskilled attention, and consequently the maintenance of same is of the lowest possible amount, and it is also of more than passing interest to note that the main working current passes only through the stationary

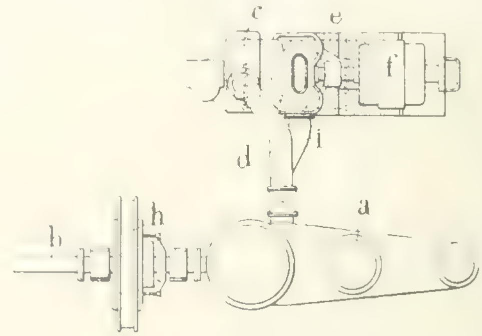


A Swiss Proposition using the Direct-Coupled Turbines at top vessel speed, and a separate Turbine driving an Electric Generator, supplying Current to Electric Motors mounted on the Main Turbine Shafts for low vessel speeds or Reverse, etc.

parts of the motor, facilitating strong and reliable insulation for the conductors and other valuable and practical points which I am sure will be appreciated by the deep-thinking and studious marine engineer.

It is interesting to compare the various published steam trials that have taken place, showing the results that are possible with electrical power transmission with high-speed steam turbines, etc., and to especially show the saving in steam that is possible.

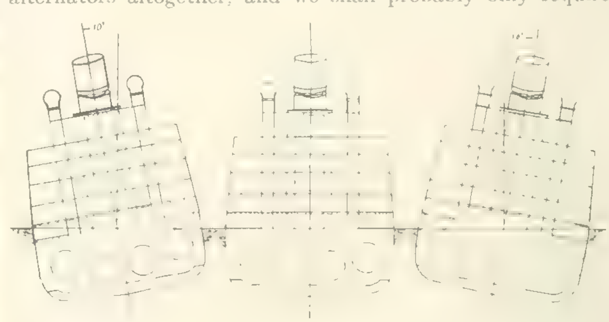
Let us assume that we wish to know what will be the steam capacity of the boilers for a vessel fitted for electrical transmission. For four propellers each requiring to rotate them 1,000 B.H.P. at 250 R.P.M., the motor would be of the polyphase induction type, with squirrel cage rotors, and with stators wound for full, half and quarter speeds. The generators would, in this case, consist of two turbo-alternators and exciters capable of between them generating and supplying 3,550 kilo-watts, and running at a speed of 1,500 R.P.M. with steam at, say, 150 lbs. pressure and 150 degrees F. superheat. These alternators would be, say, 2 pole machines, therefore, if the motors are wound for 12 poles (for top speed) it will be equal to 6 to 1 reduction in turbine for propeller speed. For half-speed the second winding would be arranged for 24 poles,



System by Mr. Parsons' Reciprocating Engine exhausting into Low-Pressure Turbine which drives Electric Generator, supplying current to Motor on Engine Propellor Shaft.

12 to 1 reduction with two sets of windings in parallel, and for quarter speed, this winding would be arranged for 48 poles, 24 to 1 reduction; with these windings in series the synchronous speeds would thus be full speed 250, half speed 125, and quarter speed 62½ R.P.M.

For the top speed the above turbo-alternators would be coupled up in parallel, and when supplying the motors with current would generate 3,250 kilo-watts, and the consumption would be, say, 16 lbs. per K.W. or 50,400 lbs. of steam per hour, or 13 lbs. per shaft horse-power, which compares, in my opinion, very favourably with what would be required with direct-coupled turbines working under similar speed and circumstances, and would be more in the order of 22 lbs. per shaft horse-power, 88,000 lbs. therefore, difference in steam consumption 36,000 lbs. per hour, representing a saving of no less than 41 per cent. in boiler capacity comparatively. Now, at half-speed we will close down one of the turbo-alternators altogether, and we shall probably only require



A Vessel heeled over 10 degrees, and also the unequal immersion of Propellers, and consequent extra resistance to Propeller Rotation. Speed can be synchronized, thus saving Power, and improved Propulsion.

say, 600 shaft horse-power at this speed; therefore, I will estimate the efficiency of the motors at this half-speed and load 60 per cent.—740 kilo-watts, the turbo-generator would use, say, 24 lbs. of steam per K.W. hour, with this load, but would run at top speed, although at half vessel speed, and this is equal to 17,760 lbs., while the direct-coupled turbines would each run at half-speed, and the consequent steam consumption would be not less than 47 lbs. per shaft horse-power, equals to 28,200 lbs. of steam or under these circumstances there would be a saving of no less than 11,880 lbs. per hour, or equal to 37 per cent. saving in steam at half-vessel speed (and I have estimated on the easy side for the direct-coupled turbine).

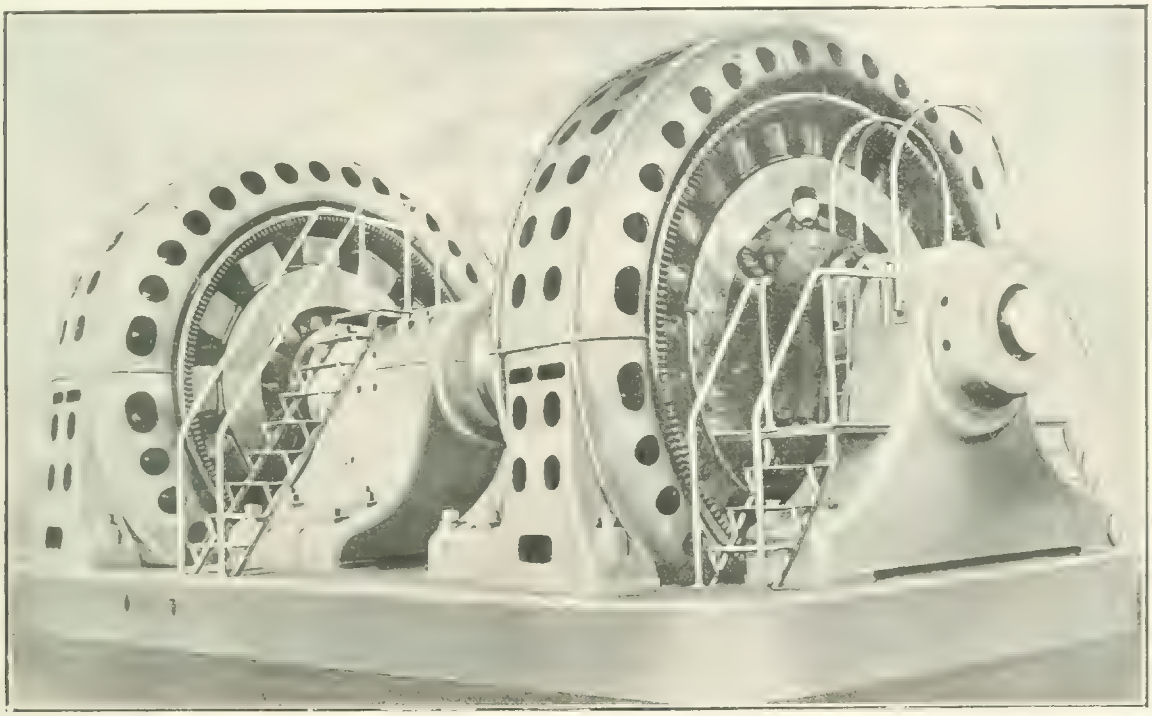
Assuming these estimates to be approximately correct, it

may be asked, what will be the relative weights between [illegible]

4,000 B.H.P. at 35 lb. per H.P. developed, say	$62\frac{1}{2}$	tons.
Conductors, switch-gear, etc.	,,	6
[illegible]		[illegible]
[illegible]		[illegible]
Steam piping, etc.	,,	13
[illegible]		[illegible]
[illegible]		[illegible]
	184	tons.

While the weight of the direct-coupled turbines and part of the propeller shafts, shaft tunnels, etc., including condenser, steam-pipes, etc., air and circulating pumps—which would have to be arranged to efficiently deal with the 88,000 lbs. of steam—would be at least (taking the speed of the turbines at 250 R.P.M.) 148 tons, showing that the electrical machinery would be about 25 per cent. heavier, but it is here necessary to point out that that only applies to the plant from stop valve to propeller shaft connections. We will now look into the possible saving in operating costs and weight at the other side of the stop valve, and taking the data that have steam that will be required for the electrically-driven vessel, 260 tons, while for the direct-coupled turbine driven vessel, the boiler equipment would weigh not less than 440 tons, or a saving in weight in boiler-room equipment for the same propeller H.P. of not less than 40 per cent. or 180 tons.

Now, as regards coal consumption and comparative saving in this direction, we will take it that with hot feed, clean flues, and with good Welsh coal, it is possible to evaporate say, 10 lbs. of water per lb. of coal burnt, so that we have in the direct-coupled turbine vessel a coal consumption of 8,800 lbs., and in the case of the electrical vessel 5,200 lbs., or a saving of 1·6 tons per hour, which equals in a ship running for six days a net saving in favour of the electrical scheme, of no less than 230 tons less dead weight and, what is very important, running cost, and this important matter will be surveyed with somewhat close interest by cargo vessel owners, as it may be at the same time observed that the propellers are run at about the same low speed as is necessary and usual in these slow vessels, in order to secure economy at the propeller and for the usual speed of such cargo vessels, it is possible to further reduce the speed of the propellers should it be considered necessary to suit the ever-varying conditions



The above Illustration shows what is probably the largest Electric Motor in the world, driving a Generator. The total amount of work that the above would be able to deal with, both coupled as motors, would be no less than 16,000 B.H.P., or equal to one shaft of the *Lusitania*. The total weight of the motor and generator is 155·2 tons.

been published, as regards the weights of cylindrical boiler, stokehold equipments, etc., which are as follows, when taking reciprocating engined vessels into account. It has been stated that good cylindrical boilers, including small and large mountings, fire box and funnel (boiler empty) with forced draught, pipe-work, including all pumps, water, steam, and exhaust pipes, gratings, platforms, etc., weight per I.H.P. in boiler-room reaches 180 lbs. Therefore, the weight of the boiler-room equipment of a vessel in which would be installed, say, two reciprocating engines running condensing would approximately be as follows :—

Taking 180 lbs. boiler equipment weight, per I.H.P. then 4,700 I.H.P., with a mechanical efficiency of 85 per cent. would equal 4,000 B.H.P. = 377 tons, and in order to get at the steam consumption per ton of boiler weight we will allow, say, 16 lbs. of steam used per I.H.P., including steam required for auxiliaries and losses due to radiation, etc., therefore = 75,200 lbs. of steam or equal to 200 lbs. of steam per hour per ton of boiler-room equipment. Under these circumstances the boiler-room equipment would weigh for the 52,000 lbs. of that will possibly be met with in practice, and this could be secured by slight increase in the weight of the motors only, the generating plant weight remaining the same.

The system is very suitable for conversion of existing single propeller vessels, while in twin propeller ships, a certain advantage is secured in economical operation by the use of one power generating plant working twin screws, with their various advantages, certain security and ease of control.

There are many other valuable points that might be put forward in support of this interesting application of electrical power transmission. The above conclusions may perhaps form a basis for discussion, but they must not be considered as being perfectly definite, on account of the widely different conditions that would be met in modern practice; but this paper is chiefly put forward to open up the way for the serious consideration of naval architects and engineers, in the hope that a new field of operations can be made for the electrical engineer, with the friendly co-operation of his marine colleague to the advantage of the ocean carriage of passengers and goods.

THE FLEETS OF THE MAIL LINES.

(From Our Correspondent.)

The Morocco Trade.

THE Royal Mail Company seems to have taken its new venture of the Forwood Line to Morocco seriously enough and to be pressing its development forward with some energy. The two newer ships which it took over with the goodwill are said to be fairly full of passengers for their first trips under the new management. Moreover, wisely enough, the new owners of the line have taken over the *personnel* with the ships and thus secure to themselves the goodwill of the old business.

Meanwhile, recognising that, at all events at present, the trade of Morocco will not stand the introduction of an additional competitor, the firm of Messrs. Elder, Dempster & Co. have re-considered their intention of opening a branch service to Morocco ports, *via* the Canary Island, and abandoned also the idea of developing the country by the building of hotels for tourists.

The Nord Deutscher Lloyd

has published an interesting tabular statement in regard to that important item of the shipowners' expenditure, coal. It shows how in the space of just thirty-two years the consumption of coal by the company's steamers has increased ten-fold both in quantity and in value. The increase is, of course, due not only to the increase in the number of vessels in its fleet, but also to the greater size and larger horse power of the various units of which that fleet is composed. In 1907, the actual figures were approximately 1,739,856 tons, costing [illegible]

The "Haverford."

The circumstances surrounding the explosion aboard the twin-screw liner *Haverford* some two years ago at Liverpool will doubtless still be within the remembrance of some of my readers. The vessel in question was at that time employed in the American Line's service between Liverpool and Philadelphia. At the time of the disaster, the discharge of cargo had just commenced. Suddenly there was a terrible explosion, which not only damaged the ship most seriously, but also resulted in the death of no less than thirteen persons. It was at one time thought that the catastrophe was the result of the explosion of an infernal machine secreted amongst the cargo by some evil-designed person, and the story of what happened at Bremen many years previously was revived. But eventually the theory of an infernal machine was abandoned, as a simpler cause presented itself. There was in the cargo of the *Haverford* a consignment of Fels Naptha soap. This was packed in a thousand boxes and altogether weighed something like forty-five tons. It appears that this soap under certain conditions gives off an inflammable or explosive vapour. This being so the shipowners brought a suit in the American courts against Messrs. Fels Brothers, the manufacturers and shippers of the soap, claiming damages to the amount of £20,000, alleging that according to the terms of the contract of affreightment, the shippers should have given notice of the dangerous character of the goods. In their defence, Messrs. Fels Brothers mainly relied on the infernal machine theory and that found no favour in the eyes of the court, to which it seemed clear that it was the vapour from the soap which was responsible for the explosion. That, however, did not give the plaintiffs their verdict, for it was shown that this was by no means the first time that vessels of the company's fleet had carried such consignments and on that account it should have been within their knowledge that under certain conditions the soap would give off explosive vapours. This being so, Judge Adams of the United States District Court held that there was a duty laid upon the shipowners to provide adequate means of ventilation to carry off such vapour as fast as it was generated. This the shipowners had neglected and according to his judgment the plaintiffs failed to establish their right to damages.

The Egyptian Mail Steamship Company.

After a brief career in which its two magnificent turbine steamships *Heliopolis* and *Cairo* have been at work something short of a single winter season in the Marseilles to Alexandria passenger trade, the directors of the Egyptian Mail Steamship Company have come to the conclusion that the undertaking cannot by reason of its liabilities continue to carry on its business and have recommended a voluntary winding up. The meeting which was held to consider that recommendation was held in private and its proceedings are not publicly known. But all sorts of rumours have been in circulation. Amongst these was one to the effect that the two vessels have been purchased by Sir Christopher Furness. I do not think there is any real foundation for this statement and believe it much more probable that the *Heliopolis* and the *Cairo* will be diverted to the St. Lawrence route. If that were to take place, Canada would at last be given her long-talked-of twenty-knot service, though, of course, two vessels could not alone maintain a weekly sailing. The advantage of such an arrangement would be that if it were carried out the ships would be advantageously employed all the year round, taking tourists to Egypt in the winter, when the rush to the South takes place, and in the summer, when few persons go to Alexandria for pleasure, busying themselves in taking their share in the now heavy passenger traffic to the Dominion of Canada.

The Kingston Harbour Dispute

has now been before the Court of Appeal, which has materially varied the decision of Mr. Justice Eve, who, it may be remembered tried the case in the first instance. The claim of the City of Dublin Steam Packet Company was, of course, too high in the first instance. It could hardly be contended that because they had a contract with the Postmaster-General for the conveyance of mails across the Irish Sea, they were to have the exclusive right to the use of the Carlisle Pier at Kingstown, and were to be able to deal with their vessels as they chose without any reference to the orders of the harbour master appointed by the commissioners of the port. On other heads the Court of Appeal naturally finds itself entirely in agreement with the judgment of Mr. Justice Eve. But the Court of Appeal considered that that learned judge had failed to take sufficient note of what passed in the year 1895 when the contract which now regulates the mail service was made. At that time it was felt that the time had come for the supersession of the five paddle steamers, which hitherto had maintained the service so well, four of these having been at work for not far short of forty years. It was believed that it would be unnecessary, at all events at first, for the contractors to provide five new vessels for the work. Four, it was thought, would be adequate—the arrangement being for two to be kept running to maintain the service, one to be kept ready for emergencies as a stand-by at Holyhead, whilst the fourth would be free to be off duty altogether, so that the fleet could take it in turn to go off the station for survey and repairs. But in the correspondence which accompanied the making of the contract in 1895, the company pressed for the provision at Carlisle Pier of a berth for a reserve vessel, which berth should be available for the accommodation of a vessel of the larger class then under contemplation, without in any way interfering with the berthing of the vessel actually running. The Government accepted the suggestion, to which it is evident from the letter that the company attached some considerable importance and, in fact, constructed or adapted the berth as desired. Mr. Justice Eve seems to have thought that having done this their obligation on this head at least was fulfilled. The Court of Appeal, however, took the view that the contract to make the new berth would be a mere mockery without the further condition being implied that the company was to be allowed to use it when constructed—and thus it will be observed, though according to the arrangement of the fleet just referred to, their only possible reserved boat would be lying at Holyhead. Further, the Master of the Rolls explained that owing to the circumstances attending the making of the contract in regard to the berth in question, he could not construe the expression "reserved berth" in its narrow and technical sense. It must be taken to mean a berth in which any vessel of the company may be placed. Since the scheme set forth for the carrying out of the new arrangement with the North-Western Railway Company deprives the Steam Packet Company of the daily use of this berth, the Court considered that arrangement to be a breach of the Government's contract with the City of Dublin Company, and held that the company were entitled to the use of the newer berth during and for the purposes

of the contract. The costs of the trials, which occupied eleven days before Mr. Justice Eve and five days before the Court of Appeal, will naturally be very heavy, and, in view of the fact that they failed to establish their right to certain of the claims which they put forward, the Court of Appeal only gave the victors two-thirds of the costs of the trials.

The Workmen's Compensation Act,

[illegible] likely to raise many nice and difficult points. Some little time ago there were certain questions as to the position of a shipmaster under the new law, and now it is the turn of the ship's steward. In a case tried at the beginning of July at the Liverpool County Court, compensation for the results of an accident sustained by him in the course of his employment was sought from the Cunard Company by J. W. Edwards, a steward of the Royal Mail steamer *Carmania*. The question before the court was the amount to be taken as his weekly earnings. There was no dispute as to what his pay was. That worked out at 15s. 6d. per week. Then there was an allowance reckoned at 10s. a week for his keep, bringing the amount up to 25s. 6d a week. But since the Court of Appeal decided in a case brought against Messrs. Spiers & Pond in respect of injuries sustained by a waiter in a restaurant car on the South-Western Railway, an addition has to be made for the tips receivable in course of the employment. Edwards considered that the value of his tips averaged a pound a week and gave evidence to show how he arrived at that conclusion. The shipowners, however, contend that as the period taken by him as a basis for his reckoning included the Christmas holidays, his reckoning was quite too high. The judge to some extent adopted the view of the employers, and in the end fixed the amount to be taken as the standard at 16s. a week, which would seem to show that one way or another such a steward as Edwards makes just about a couple of pounds a week.

The New Cunarders.

The *Mauretania* continues to do well, though, as she is still at work with but three out of her four propellers, she is not doing anything very out of the way. The *Lusitania*, on the other hand, is beating her own records, and, of course, those of her sister. On the 10th July she reached Sandy Hook, having accomplished her passage at the unprecedented mean speed of 25·01 knots, the distance being 2891 nautical miles. The total was made up as follows :—

To noon	5th July,	21 miles,	speed	25·20	knots.
,,	6th ,,	[illegible]		[illegible]	
,,	7th ,,	[illegible]	,,	25·05	,,
,,	8th ,,	[illegible]	,,	25·02	,,
,,	9th ,,	[illegible]	,,	24·75	,,
2.11 a.m.,	10th ,,	[illegible]			
		2891 miles.			

Her best day's run, 643 miles at 25·43 knots speed, is, of course, a record. This beats the previous record of 641 miles which she herself achieved on her last voyage in the same direction. We shall yet see her do what I ventured to prophesy for her on her trial trip, *viz.*, get 650 nautical miles into a single day's [illegible]

Shipping in Wartime.

The committee appointed by the Treasury to supplement the results attained by the Food Supply Commission, and to see whether it be possible, or expedient, to outline some practical scheme of national guarantee or insurance of floating property in war time, has now issued its report.

The Committee was charged with the duty of stating its opinion as to whether or no it is desirable that the State should undertake to make good to shipowners and traders losses incurred through the capture of shipping by the enemy in war time, and if so whether the indemnity in question should be granted gratuitously or otherwise, and generally to recommend —if the idea were held to be a good one—something which might be considered to be a workable scheme. In the event the Committee came to the conclusion that it would be best to leave things as they are, and accordingly it makes no recommendations.

The Committee state that on almost every point of the inquiry the evidence was of the most conflicting character. The diversity of opinion not only touched the desirability of State action, but even extended to the view of its results, and the members of the Committee fully realize that much of the evidence which was laid before them would have warranted them in forming conclusions opposed to those which they actually in the event adopted. They, however, started on the hypothesis—which we may hope will ever be a well-founded one—that the British nation will continue to have a navy sufficient and efficient for the manifold duties which will assuredly be laid upon it in time of war. If the Royal Navy be equal to its responsibilities the members of the Committee are of opinion that much of the fear expressed as to the effect of war upon our shipping and commerce will prove to be exaggerated. There is, in their opinion, little ground to apprehend that British shipping on any large scale will be laid up as a consequence of war, at all events for any long period, though they do not feel satisfied that there may not be some danger of merchant tonnage being transferred to neutral flags. But even that danger they imagine will not be likely to involve any large proportion of the national fleet. They are of opinion, too, that if matters be left to the ordinary conditions of commerce, though rates may, in some cases and at some times, be so high as to interfere with trade in certain directions there will always be a market quotation for every risk, though in some cases the rates may rise to such a point as for a time at least to cause an increase in the cost of living and of manufacture.

They are, however, of opinion that the proposed remedy might be worse than the disease, for they point out that such a national guarantee as has been suggested, whilst it would tend to prevent the transfer or laying up of ships, would assuredly not tend to secure their safe arrival. So at best it could only relieve the consumer of that portion of the enhanced cost of his supplies which would be represented by the amount of the premiums actually payable. A free indemnity the Commissioners hold to be impracticable, for whilst no materials exist to enable one to form any indication of its cost to the nation it would obviously be very heavy, whilst its action would be unfair, in so far as it would be the case that the losses incurred would fall on the nation at large, whilst the profits in case of successful voyages would be retained by the individuals interested, and, of course, the heavier and more numerous those losses which fall upon the State the greater would be the profits of the lucky individuals. It is also felt that neutrals would be apt to transfer property to the British flag before the voyage commenced, thus increasing the national responsibility, whilst at the same time feeling that they would be sure, in any event, that those in charge of the ventures would not have the same reasons for being cautious as they would have under ordinary circumstances. Finally, it is shown that there would be immense administrative difficulties in the way of working any such scheme as had been put forward. No doubt these difficulties could be met and overcome. But it was hardly worth while devoting much trouble to elaborating a scheme when the feeling of the Committee was against the principle involved. Sir George Clarke, who is now Governor of Bombay, did not sign the report, and in a separate memorandum over his signature, a suggestion is made as to the practicability of meeting the situation by the institution of a system of indemnity at fixed rates, which he considers sufficient to prevent any excessive fluctuations in quotations. That, he thinks, is all that can be achieved or indeed attempted. For he remarks that no system of State indemnity can do more than provide a safeguard against the effects of an exaggerated and violently fluctuating estimate of the risk which might prevent our shipping from going to sea, with the grave results which would be entailed, and he believes that the proposal he makes would effect the object he has in view without a very great cost to the State. But we may take it that in spite of what Sir George Clarke has said the whole matter is indefinitely shelved.

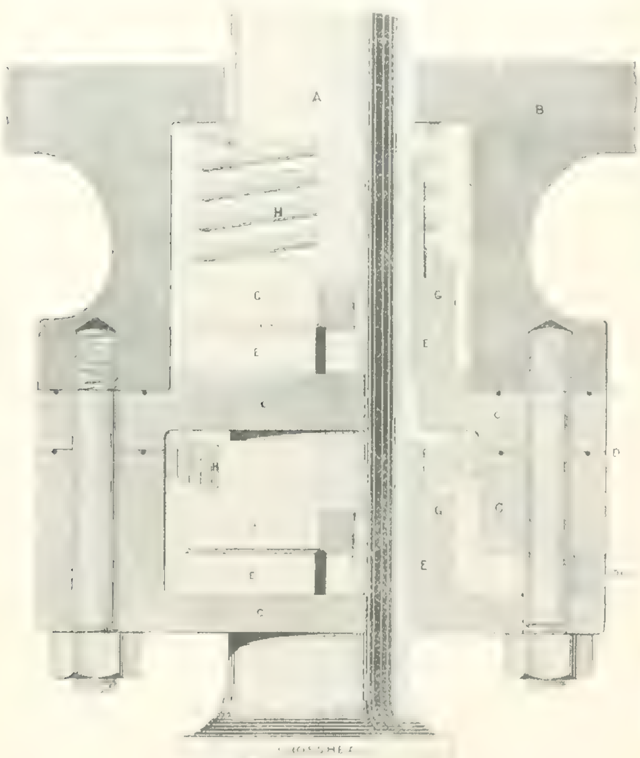
A Curious Explanation

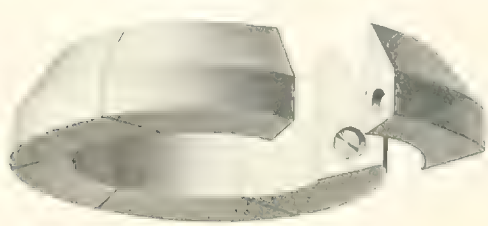
has been put forward to account for the recent explosion on board the Hamburg-American liner *Arcadia* at Philadelphia. Four persons lost their lives and the ship herself was sunk and badly damaged. It appears that the explosion occurred in No. 4 hold, where there were stowed some sixteen cases of patent corks, which are filled with a certain brown powder, which, it is alleged, is under certain conditions of an explosive nature. The matter will no doubt be the subject of an exhaustive inquiry, and it may, therefore, be well to reserve further discussion for the moment.

WARD'S METALLIC PACKING.

IN the adjoining diagram we illustrate the double ring packing which has been designed by Messrs. S. A. Ward & Co., of Broad Street Lane, Park, Sheffield, and which has been used on the Austrian Lloyd steamers *Baron Gautsch* and *Prinz Hohenlohe*, for use in ordinary stuffing boxes.

Referring to the illustration, it will be observed that the piston rod *a* passes into the stuffing box *b* in which the special packing is located. On the under side of the stuffing box two boxes *c c* are mounted, the outer one of which is provided with means for connecting a drain pipe. The boxes are jointed together





and to the stuffing box by means of copper wire rings *d d*. In the stuffing box *b* and in the lower box *c*, packing segments of anti-friction metal are arranged in such a way as to be self-adjustable, the pressure being carried entirely upon the standing faces. The yielding of the ends under heat and pressure enables them to automatically adjust themselves to any slight wear. In order to reduce the amount of surfaces where the segments butt against one another, holes are drilled as shown in the illustration. About the segments are arranged coned hoops *g g* which keep the segments in place by pressure exerted by double spiral and double volute springs *h h*. The springs have very little compression, but sufficient to enable the hoop to move down the cone segment as wear takes place. It may be mentioned that the drain, not being subjected to steam pressure, can be coupled up with the condenser with advantage.

The mixture of the metal for the white metal is arranged to suit each of all the various pressures and temperatures, as what suits one pressure is not suitable for another. That is, segments made for a high-pressure rod would not suit if put to work upon a low-pressure rod, each packing is arranged to suit each pressure, etc., so that within certain limits, of course, they become very slightly plastic under heat and pressure. The packing segmental ring is divided angularly, and at the end of the section is drilled, for a short distance up, to reduce undue friction; as before stated, this allows the joints to yield, by a long slow process, which is just enough to keep most of the pressure of steam from exerting its full force upon the sections and through them direct on to the piston rod, which is common to all other packings; at the same time the joints are always hard up and in close contact, so that it is quite impossible for anything to get past them, the cone hoop with spring behind keeping them in position against the cover face.

We understand the sections will wear away almost to nothing without being touched. No fitting is necessary as they are perfectly true when turned out of the works.

BOILER EXPLOSION ON THE STEAMER "PAHUD."

IT is seldom that a disaster of such a serious character happens to a marine boiler as that represented by the illustration which we reproduce on opposite page, from a photograph received by the courtesy of Mr. G. E. Morrell, Associate Member of the Institute of Marine Engineers. The explosion of the boiler as shown occurred on April 19th on board the *Pahud*, belonging to the Koninklyke Paketvaart Maatschappij, a Dutch company trading to Sumatra. The steamer was at the time lying at the wharf at Belawan, and, according to the *Penang Gazette*, there were eighteen persons killed and forty wounded more or less severely. The cause of the accident had not transpired, but the investigation report will probably reach us later, and it will be deeply interesting. The *Pahud*, of about 2,000 tons, was built in 1906, and is described as one of the finest steamers owned by the company. The explosion burst the side of the ship out for about thirty feet fore and aft.

Boiler Explosion on the steamer "Pahud."

NAVAL MATTERS—PAST AND PROSPECTIVE.

Portsmouth Dockyard.

It is many years since Portsmouth Harbour presented such a deserted appearance as it did during the month of July. Quite sixty vessels belonging to the port left to take part in the fleet exercises, there being only four or five ships left in the stream, including the Royal yachts and the *Enchantress*. As to destroyers, only the *Leopard*, *Daring* and *Derwent* were left behind, the two latter leaving on July 11th. The boilers of the *Leopard* are being retubed. The *Derwent* had a defective casting to her machinery replaced and the steering gear of the *Daring*, which was damaged by fouling a coal hulk, was made right. While the docks have been empty some of the harbour craft have been seen to, among them the hulks *Vernon II.* and *Vernon III.* formerly the *Marlborough* and *Warrior*. The new cruiser *Indomitable* was commissioned on July 2nd by Commodore King Hall for the purpose of conveying the Prince of Wales to Canada. The vessel left on July 15th, the cruiser *Minotaur* joining her at Spithead. A few of the special service cruisers stationed at Spithead saluted the Prince, but beyond that there was no ceremony. Work on the *Bellerophon* is proceeding rapidly, all the turrets and heavy guns and the hydraulic fittings and gear being in position. The engine and boiler rooms are materially advanced as regards the working fittings, and it is confidently expected that the vessel will be ready for her trials in September. Two armour plates have been taken off the side of the ship for testing purposes by the staff of the Gunnery establishment, the reports being very satisfactory. It is not very often that plates are taken off a vessel; they are usually tested beforehand. A good deal of work is entailed, seeing that the plates each weigh over 10 tons. The loom defences of the harbour are shortly to be tested, and arrangements are being made to fix a date. The royal yacht *Victoria and Albert* is being got ready for the King's use during Cowes week. The *Alexandra* and *Alberta* will proceed to Cowes for the accommodation of His Majesty's guests. The *Alexandra* left here at the end of June for Dover, and from there proceeded to Calais, Boulogne, Flushing and Ostend in order to obtain information with regard to the berthing of the vessel at any future visit. Carpenter-lieutenant Rice, of the *Victoria and Albert*, who was recently promoted, was the recipient of royal honours during the King's recent visit to Reval, having been invested by His Majesty with the Royal Victorian Order. Lieutenant Rice was subsequently included in the Royal dinner party, when the King, on behalf of himself and the Queen, presented him with a scarf pin with the monogram "E. and A.", in diamonds, surmounted by the Royal Crown. At the end of June Rear-Admiral Sir Henry Jackson, the Controller of the Navy, visited Portsmouth, and, accompanied by Vice Admiral Robinson, the admiral-superintendent, and Mr. J. Apsey, the manager of the Constructive Department, embarked in a torpedo boat and proceeded to the wreck of the *Gladiator*. At the time of writing there is every indication that the vessel will be lifted very shortly; the work has been hindered very much by the unfavourable weather. Admiral Jackson will not probably pay us another visit in his official capacity, as I understand he will soon be retiring from the Admiralty. On July 14th three obsolete battleships were offered for sale, but only two were disposed of. The old *Dreadnought*, 10,820 tons, which was launched at Pembroke in 1879, realized £23,000, while the *Orontes* (late *Swiftsure*), 6190 tons, launched in 1871, fetched £17,550. Another Pembroke vessel, the *Collingwood*, 9500 tons, launched in 1886, was bought in at £19,100, the reserve price not being reached.

Chatham Dockyard.

There have been very few ships in port during the month; fewer, indeed, than there have been for many years. Almost every available vessel left to take part in the manœuvres, and only those which were being repaired, together with the establishment ships, remained. It was natural that there should be some mishaps during the operations, but these have been remarkably few seeing the large number of ships engaged. The destroyer *Ranger* was the first to suffer. She was steaming in company with the cruiser *Topaze* and a number of destroyers off the Outer Dowsing light on July 2nd, when, during a thick fog, the *Haughty* ran into her starboard quarter close to the propellers, making a hole in her side. The commanding officer promptly adopted every means to secure the safety of his vessel, and canvas was placed over the hole and the pumps got to work. These efforts were successful and, although the vessel shipped a great deal of water, she was able to proceed here under her own steam. On being docked it was found that the hole extended almost to the water line. The *Haughty* only had her bow slightly twisted. The repairs to the *Ranger* were very smartly carried out, and she left to rejoin the flotilla in the North Sea on July 14th. The obsolete battleships *Camperdown*, *Edinburgh* and *Rodney* which have been moored in the Medway at Kethole Reach for some time past, are to be brought here for dry docking. The *Rodney* will be afterwards towed to Harwich, where she will be used as a berthing ship for the Nore submarines to moor alongside, Harwich being now the head-quarters of the Nore flotilla. A large battleship practice target, built by Messrs. Gill & Sons, of Rochester, has been delivered here. It is, I believe, one of the largest targets ever built. It measures 141 ft. in length and is 5 ft. wide, while it has a draught of water of 20 ft. Upon this is built the target, which consists of lattice work measuring 90 ft. by 30 ft. All told, its weight is about 170 tons. So good is the shooting of some of the ships, that these targets are sometimes totally demolished. Indeed, last year additional money for targets had to be asked for in consequence of the good shooting. Messrs. Gill have several other targets in course of construction. The dredger *St. Andrew* has come round from Devonport for the purpose of engaging in dredging operations in the Medway.

Devonport Dockyard.

It has been a very quiet month, for the port has been almost denuded of ships, about fifty vessels, ranging from battleships to submarines, having been requisitioned for the manœuvres. To bring these vessels up to full complement, about 3500 men were required, but everything was carried out successfully and without the slightest hitch. The construction of the battleship *Collingwood* is proceeding apace, and she is now, I should say, advanced to the extent of quite 70 per cent. of her launching weight, the amount of material built into the hull being about 5000 tons. It is expected that she will be launched at the beginning of November. The battleship *Téméraire* will be delayed, as on July 4th forty men employed by the engineer contractors, Messrs. Hawthorne, Leslie & Co., came out on strike, and as a consequence twenty labourers had to be discharged. It has been unofficially suggested that the Admiralty should place the vessel's completion in dockyard hands. The two pairs of electric dynamos which form part of the outfit of the vessel have been received from Messrs. Siemens. The larger pair give 900 ampères and 220 volts when the armature is revolved at 400 revolutions per minute, and the smaller pair 450 ampères. Among other work in hand are the destroyers *Arab* and *Fairy*, whose refits are approaching completion. The boilers of both vessels have been retubed and two new funnels hoisted on board the latter. Good progress is being made with the reconstruction of torpedo boat No. 99. The surveying vessel *Mutine* arrived on July 5th and has been docked for an examination of her under-water fittings, after nearly a year's work, mainly on the West Coast of Africa. She will be ready for sea by the end of August. Another vessel to be docked is the special service battleship *Resolution*, this being for an examination of her under-water fittings, with special reference to her shaft bearings. One of our vessels, the cruiser *Æolus*, was selected to go to Avonmouth when the King opened the new dock there. On her return she proceeded to Portsmouth and thence to Dover with a flotilla of seven submarines. During the voyage what might have been a disaster occurred to submarine "A9" owing to an escape of gasoline, all the officers and men being rendered unconscious. The two lieutenants, who were in the conning tower, noticing something wrong, went below and found the engines going at full speed and the men lying about apparently lifeless. Enveloping their faces with wet cloths, they descended, but were both rendered unconscious, not, however,

[illegible] in response to the officers' signals and the crew were taken to the parent vessel and restoratives applied these being successful in every case. Some journals have put the mishap down to the absence of white mice from the submarine. There is, however, a mechanical instrument for indicating the presence of noxious gases, but it is doubtful whether it has been supplied to all the submarines. The work of converting the torpedo gunboat *Onyx* into a store and repair ship for submarines is making good progress, and she will probably be ready to take up her new duties by the time the vessels return from the manœuvres. When the cruiser *Niobe* was relieved by the *Leviathan* as flagship of the local division of the Home Fleet a list of defects and alterations was submitted to the Admiralty, with the result that several items, including the fire-control appliances, were struck out and others ordered to be postponed. Their lordships came here on July 1st to inspect the various establishments their visit lasting until the 3rd, when they returned to London. Captain T. H. M. Jerram, of the Royal Naval Engineering College, Keyham, has reached flag rank and vacates that post. He has had great success in the training service, and was specially promoted to captain for his efforts in that direction. Previous to coming to Keyham in December, 1905, he was for three years inspecting-captain of boys' training ships. Rear-Admiral Jerram owes his promotion to the retirement of Admiral W. H. Henderson, who was Admiral-Superintendent here two years ago. He will be succeeded on July 30th by Captain L. G. Tufnell, who was awarded the C.M.G. in January last in recognition of his services during the riots at Shanghai in December, 1905, at which time he was in command of the cruiser *Astræa* on the China station.

Pembroke Dockyard.

Although Pembroke was not affected by the manœuvres, we had a visit from six of the vessels engaged in the operations. The vessels, which put into Milford Haven on July 12th for four days, were the battleships *Albion* and *Cornwallis*, of the Atlantic Fleet and the *Drake* (flagship of Rear-Admiral Adair), *Antrim*, *Carnarvon* and *Devonshire*, of the Stand Cruiser Squadron. It has been officially decided to call our new cruiser the *Bellona*, a name which disappeared from the "Navy list" last year, when the third class-cruiser that bore it was sold to be broken up. The old vessel displaced 1830 tons, had engines of 4700 horse power with forced draught, and could steam at 17·8 knots. The new one will be 3350 tons, have engines of 19,000 horse power, and will probably attain a speed of 25 knots. The *Bellona* is making excellent progress; indeed, she is making headway more rapidly than any previous ship has done here at such an early stage. More hands, however, are employed on her than usual and piecework has been very largely resorted to. Already the launch of the vessel is spoken of, and a date—September 11th—has already been mentioned. That, however, is very unlikely, and the launch will not probably take place until December or January. The fitting of three propeller shafts instead of four, as in the *Boadicea*, has been considered, but the idea has been abandoned because it was not practicable with a ship so narrow. As to the *Boadicea*, her turbines are all on board, and the work of closing in the decks and completing the main structural parts of the hull is being pushed on. The cause of the detention of our other vessel, the *Defence*, has been explained in the House of Commons by Mr. McKenna. On July 8th the right honourable gentleman said that it was on account of the non-delivery of some of the capstan gear by the firm who have the contract for its supply. This gear has now been delivered, and when it has been fitted the ship will be ready to leave Pembroke. The crew, said Mr. McKenna, will be available when the ship is ready. It appears that there was difficulty in getting a satisfactory motor for the electric capstan, and it is said that three or four were tried. The fitting of an electric motor to the main capstan is an experiment. Every ship in the Navy, with the exception of the *Defence*, has a steam capstan fitted forward. In some vessels electric capstans have been fitted aft, but they are smaller and less powerful than those forward. The latest information is that the *Defence* is to be navigated to Devonport on August 4th to be prepared for her steam and gun trials. A thirty hours' trial at one-fifth power is arranged for August 26th. The gun trials will be carried out by the staff of the *Excellent* on September 4th, and five further steam trials will follow. The refit of the destroyer *Greyhound* is mainly to do with the machinery. The engines are to be opened out and all defective parts replaced, while all the steam pipes are to be renewed and retested. I have previously referred to the "camels" being built here for use at Dover Harbour. The first of them has been launched. It is a massive piece of work, weighing about 130 tons, and is 40 ft. long, 20 ft. wide and 7 ft. 6 in. deep, the wood of which it is built being Dantzic fir and English elm.

Sheerness Dockyard.

Sheerness Harbour has been practically deserted all the month, and when the torpedo boat flotilla passed to sea on July 10th there was not an effective warship in the Medway. In the steam basin there were only the sloop *Wildfire*, the destroyer *Sprightly* and a few of the yard craft. The *Sprightly*, which has been reboilered, will shortly be ready for sea. Four torpedo boats are also under repair. The flotilla of fifteen torpedo boats commenced their cruise by ascending the Thames and mooring at several points between the Tower and London Bridge. It is twenty years since so many of His Majesty's ships went so far up the river. On that occasion a flotilla of destroyers escorted the Shah of Persia from Gravesend to Westminster. The boats returned here on July 13th, and next day proceeded to Margate for combined exercises with the Portsmouth and Devonport flotillas. The visit to London was not without its tragic side, a petty officer having fallen overboard at night from one of the boats. He was missed in the morning, but nothing more was heard until his body was recovered a few days later. The *Hornet*, of the local destroyer flotilla, was detained in consequence of her steam-steering gear not working satisfactorily. She put to sea on July 12th, but when between Garrison Point and the Nore the gear again broke down and she had to return. The defect having been put right, she left three days later for the East Coast of Scotland to join the flotilla for the manœuvres. Another destroyer, the *Ettrick*—belonging to the Eastern group—was kept here to complete the adjustment of her port propeller shaft couplings, leaving for the East of Scotland on July 11th. The destroyer *Ranger*, of the west flotilla, came in damaged at the beginning of the month, and was sent on to Chatham to be repaired. The gunboat *Thresh*, having had her refit completed, is ready to resume her duties under the admiral commanding the coastguard and Reserves. The closing of the Gunnery School was, of course, associated with several farewell scenes, including a valedictory address by Rear-Admiral Coke. In the evening the officers met for the last time at mess, the admiral, his wife and daughter being the guests of honour. The drill grounds of the school are in future to be used for recreation purposes by the officers and men of the ships stationed at this port. Admiral Sir Hugo Pearson will be remembered by many at Sheerness. At the beginning of last year he was succeeded by Admiral Sir Gerard Noel as Commander-in-Chief of the Nore. Sir Hugo has now reached the inexorable age limit, beyond which no admiral may go, and he has consequently been placed on the retired list. The good wishes of his many friends at Sheerness follow him. Captain Johnston Stewart took up the duties of Captain-Superintendent on July 1st. Almost as soon as he came a piece of good fortune came his way, for he was awarded a good service pension of £150 a year.

THE INSTITUTE OF METALS, formed by resolution of a meeting held on June 10th, at Storey's Gate, Westminster, in the premises of the Institution of Mechanical Engineers, has in all probability a most useful and prosperous career before it. The hon. secretaries are Prof. H. C. H. Carpenter and Mr. Wm. H. Johnson. The need for such an institute has been frequently mentioned, especially when anomalous or abnormal cases have arisen for discussion in ordinary engineering circles, baffling the usual methods of investigation to discover causes from results, such as undue wasting or failures in metals. The occurrence of such cases in future, discussed by experts in metals, will doubtless lead to good to all concerned.

ELECTRICAL NOTES.

(From our Own Correspondent.)

New Type Electrical Fan.

DISC fans operated by motor have become so general in recent years that any improvements are worthy of note, and one that appears to merit attention is that supplied by the Mitcham Fan Co., by which the speed can be varied readily without any complications such as resistance and cutting out or in sections of the field. The system is to wind the field coils with three different gauges of wire, and the direction of winding around the core is changed at the end of every two layers. We have first the speed control and certain advantages, as the beginnings and ends of each wire are left outside the coil, and these, with the armature leads are brought to the controller, which is simply a switch to permit of the mechanical grouping of the beginnings and endings of the wires employed. With this controller it is possible to vary the speed from 500 revolutions to 900, and so when desiring to clear a confined space of foul air quickly the high speed is used and at ordinary times the low one. There is seen to be by the arrangement no waste in resistance. At the high speed on a 24-in. air propeller and with 275 watts, 6000 ft. of air was discharged, while at the lowest speed with 175 watts there was 3500 ft., which are seen to be very good results.

Ship Equipments.

A paper has been read at the Liverpool Engineering Society on this subject, from an electrical standpoint, which probably is of interest at the present time as affording means of summarizing the position. It is mentioned that ironclad dynamos increased the total weight 60 per cent. for the same output over an unenclosed machine. Cables are tarred and braided when armour is employed, as without this protection it has been found that iron wire armour perishes in cattle holds for example. In the Navy lead-covered cables are used, vulcanized rubber being the insulation. The usual voltages have been 100, but this figure entailed large dimensions of cable and a higher voltage is therefore becoming general, as regards electrically-driven auxiliaries for a boat with 1600 H.P. main engines. The author gives it that the electric installation for such a vessel would cost about £630 more than for steam, all the details being furnished. As to running charges it is estimated that for such a boat there is a saving by electric drive on the fuel bill of 56 per cent. on £180 per annum. The points made by the author are suggestive, and will no doubt be received accordingly.

Electrically-driven Tools at the Franco-British Exhibition.

In the case of a planing machine the motor of 20 H.P. is connected on the one side to a change-speed gear box, which drives a belt pulley at three different rates, and on the other to a plain pulley which gives a constant speed for return. The gear box enables three table speeds of 20, 40 and 60 ft. per minute to be obtained, while the return is at 180 ft. In a turning and boring mill with two tool heads a 16 H.P. motor drive to its gear box below gives a range of twenty-four table speeds. In a radial drilling machine the motor is employed with the gear box again giving a total number of eight speeds. From the above it will be seen that the tendency of all these machines is the same, that while using an electric motor variation of speed is obtained by gearing.

Metallic Lamp Filaments.

Further particulars are being published relating to these lamps, by which we obtain more accurate knowledge as to the process of manufacture. In the tungsten type, the latest, the candle power is higher for the watt expenditure than in the case of the Tantalum. The process is different in the two systems, it not being possible to draw a tungsten filament as you can a Tantalum. Either a binding material is employed and the compound forced to shape or a deposit of tungsten is made on a carbon filament, removal by heat leaving the metal by itself intact. The efficiency of these filaments, combined with long life, is due to the radiating properties of the metal. It is said that a carbon filament, to have the same efficiency, would need to have a temperature approximately 100°C. higher than that of a tungsten filament and 350°C higher than that of a carbon lamp. It is also said that these lamps reduce the total cost of 1000 candle-power hours from 13·67d. for carbon lamp to about 6·25d. The average useful life of the lamps is about 2000 hours, and the loss of candle power is small, some, after 3000 hours use, were said to still give 70 per cent. of their original candle power.

OBITUARY.

Mr. John Dickinson.—We have this month to record with regret the death of a well-known captain of industry, and a pioneer in marine engineering, Mr. John Dickinson, of the Palmer's Hill Engine Works, Sunderland. Mr. Dickinson was born at Hebburn in 1825, and if he had lived a day or two longer would have completed his 83rd year. He had always maintained a controlling hand in the business with which his name was associated, and as late as the middle of June he was at the offices, attending to matters that claimed his attention. Towards the end of June, feeling somewhat out of sorts, he decided to visit Harrogate in the hope of being benefited by the salubrious surroundings at that health resort. His health did not improve, however, and his friends had soon to abandon hope in this direction, as bodily weakness became more pronounced. The members of the family were summoned to his bedside at the end of June, and though he rallied slightly for a few hours, the end came on the morning of July 3rd. Mr. Dickinson's long life was almost exclusively devoted to the study and advancement of engineering knowledge, and more particularly to the development of the Palmer's Hill Works. From the time he came as a working journeyman engineer to Sunderland, he never wavered in his purpose to start business on his own account, and some four years after his advent on Wearside he found himself in a position to try the experiment. In 1852 he made a commencement in a very small way indeed, but still it was a start in the career he had marked out for himself. He appears to have shown exceptional foresight in the selection of the site for his small start in business, for it was on a quickly sloping bank which admitted of the shops being built in terraces, the final one (the erecting shop) being on a level with the quay, and quite close to it. The Palmer's Hill Works as they now stand are the result of half a century's gradual development, and are a lasting monument to their founder's enterprise and keen perception of what was requisite to secure the best results in economical working. In 1895, the business was converted into a limited liability concern, with Mr. Dickinson as chairman of directors, and his sons having positions on the board. Since then the firm of John Dickinson & Sons has become universally known as one of the foremost marine engineering firms on the North-east Coast. In shipping circles the firm stands for the highest skill in the carrying out of contracts, and for the strictest integrity in business transactions. Mr. Dickinson was a member of the Wear Commission since 1891 and was a justice of the peace for the county. He was a connoisseur in art, and his collection of pictures at Park House (his late residence) is said to be one of the most valuable private collections in the North. That the deceased gentleman was desirous of cultivating the public taste in art is shown by the fact that he has left to the town of Sunderland this splendid collection of paintings (thirty-one pictures in all) to be exhibited in the Sunderland Art Gallery, as soon as arrangements can be made for their reception. Mr. Dickinson was unassuming and kindly, and always disposed to give assistance in any real case of distress. He was a liberal subscriber to the various local charities, and was a life governor of the Sunderland Infirmary. He was also a governor of the Southwick and Monkwearmouth Hospital, and took a deep interest in the welfare of these institutions. The deceased gentleman, who was a widower since 1875, leaves three sons and four daughters. The sons are Mr. James C. Dickinson, Mr. F. Dickinson, and Mr. Alfred Dickinson, all of whom are engaged in the control and management of the works. The funeral took place on July the 6th and was largely attended, not only by local notabilities, but also by gentlemen representative of shipping and engineering interests from a distance. The office and designing staffs, as also the different heads of departments, and the whole body of workmen employed at Palmer's Hill also attended to show the last tribute of respect.

Industrial and Trade Notes.

THE CLYDE AND SCOTLAND.

(From our Own Correspondent.)

Half-Year's Output.—During the first six months of the year, which, of course, had not expired when our last month's notes were penned, Clyde shipbuilders launched 143 vessels aggregating 140,150 tons, this being considerably under one-half of the figure for the corresponding period of last year, when the output consisted of 171 vessels of 302,850 tons. This year's figure indeed is lower than that of any first half-year since 1893, when it was 118,700 tons. With the exception of four very lean years—1885 to 1888—the output for the period has almost been nearer 200,000 than 100,000 tons since 1880, when it was close on 107,000 tons. It was over 200,000 tons for the first time in 1898, and over 300,000 for the first time in 1906. Now, the production of the first half-year has suddenly dropped from the second best on record to 140,000 tons, and there are too many indications that at the end of the year the reduction on the whole twelve months will be equally marked. It is worthy of note that of the total output for the six months—140,150 tons—as much as 72,000 tons, or considerably over one-half, was built to foreign account. Of this amount nearly 46,000 tons was made up by only eight vessels, giving the notably high average of 5740 tons per vessel.

Clyde Shipyards and the Depression.—The Fairfield Shipbuilding and Engineering Co., Ltd., Govan, as a result of the depressed condition of the shipbuilding industry, have closed their works for a much longer Glasgow Fair holiday period than usual, and they have also decided to reduce, very considerably, the working hours of the establishment after operations have been resumed. The works were closed on Wednesday, July 15th, and will not reopen until Friday, August 3rd—a three weeks' cessation. Afterwards, and until further notice, the yard will be put on a 40-hours' working week, the daily working period being from 8 a.m. to 5 p.m. during five days, and no work whatever on Saturdays. Such a serious cutting down of the working hours has never before been resorted to in the history of the Fairfield establishment. The only vessel at present under construction is a new liner for the Orient Co., while in the fitting-out basin nearing completion is the Canadian Pacific Railway Co.'s steamer *Princess Charlotte*. For some time past discharges of workmen and of staff officials have been frequent at the works of Messrs. William Beardmore & Co., Dalmuir, and with nothing on the stocks and only one vessel—the twin-screw *Orcomo*—for the Pacific Steam Navigation Co. nearing completion in the fitting-out basin only a small number of workmen were employed. To facilitate completion, however, they had a shorter holiday than usual. Unless fresh contracts are at once booked it is not unlikely that shortened hours will be arranged here, if indeed the works are not wholly closed for a time. It was also intimated by Messrs. Archibald MacMillan & Co., Dumbarton, that the firm would not require their workmen to resume immediately after the usual holidays. Their yard closed on July 16th and operations will not be resumed until August 10th—a stoppage of one month.—Messrs. John Brown and Co., Clydebank, closed their large establishment on July 16th, but in order to expedite the completion of H.M.S. *Inflexible*, they reopened again on Monday, July 20th, in this case a very limited holiday indeed.

New Pacific Steamer.—An interesting contributary item to the output for July was the twin-screw steamer *Makura*, launched by Messrs. Alex. Stephen & Sons, Ltd., Linthouse, to the order of the Union Steamship Company of New Zealand, Ltd., for the service between New Zealand, Australasia and Vancouver. The dimensions of the vessel are :—Length, 470 ft. ; breadth, 58 ft. ; depth, 35 ft. While principally designed for passengers, she will carry a considerable amount of cargo, the holds being worked by hydraulic hoists, a system of cargo gear almost universal on the Australian coast on the best steamer lines, and similar to those fitted on all the steamers built by Messrs. Stephens for the colonial trade. The passenger accommodation is very extensive, and includes first, second and third classes. The engines, which have also been constructed by Messrs. Stephens, are twin screw and of the four-crank type, and in order to reduce vibration to a minimum they are balanced on the Schlick-Tweedy system. The electric engines are fitted triplicate to cope with the unusually complete system of lighting and heating, and to reduce to a minimum any chance of a breakdown.

New Contracts.—As indicated in what has been said as to the half-year's work accomplished, and the poor prospects for the second half-year now fully entered upon—the outlook is depressing. During June and July (so far as at the moment of writing one can speak with certainty of the latter), the amount of fresh booking has been "below par." The following are without further comment the principal items :—Messrs. Yarrow & Co., Scotstoun, are to build a shallow-draught steamer for the Irrawaddy Flotilla Co. ; William Hamilton & Co., Port Glasgow, two large steamers on the Isherwood system (as described in last month's notes), for Liverpool owners ; Charles Connell & Co., Whiteinch, a steamer of 300 ft. length for C. T. Bowring & Co., Liverpool ; the Ailsa Shipbuilding Co., Troon and Ayr, five horse-boats for the Admiralty ; Messrs. Ferguson Brothers, Port Glasgow, two steam single-screw tugs larger and more powerful than four generally similar tugs built by this same firm for the same company within the last four years. On the East Coast the most important bookings during the period are two steamers each of 1200 tons by Messrs. Ramage & Ferguson, of Leith, for Messrs. James Currie & Co., and two cargo vessels, each of 900 tons, as well as two steam drifters by the Montrose Shipbuilding Co.

Clyde Trust Ferries and Dredgers.—The new elevating deck vehicular ferry steamer *Finnieston No.* 1, built to the order of the Clyde Navigation Trustees by Messrs. Ferguson Bros., Port Glasgow, was launched in June and is just about to be put on her station doing cross-river service within the harbour of Glasgow at Finnieston. This interesting craft has superseded a similar but smaller vehicular ferry, which has been removed to the crossing at Govan to take the place of the present one-deck horse ferry which has hitherto done service there. The approaches on both sides of the river will be altered to suit the elevating deck system. A third—and the first—vehicular ferry of the elevating deck type, which was built by Messrs. Simons & Co., the originators of this class of vessel—does service between Whiteinch and Linthouse, a mile or so further down the river than Govan. The *Finnieston*, just about to be put in service, has on its elevating deck four tracks for vehicles, and is capable of carrying sixteen loaded lorries and horses, being thus much more commodious than the previous ferries. The Clyde Trust have resolved, on the recommendation of the New Works Committee, to order a new dredger of the most modern type. At present the Trust have only three modern dredgers in use—the *Cairndhu*, the *Craigiehall* and the *Shieldhill*. Of the two older dredgers, both of which are to be sold, one dredges to a depth of only 34 ft., has seen forty years' service and is now in need of extensive repair. It has also been decided to order four new barges. The Trust have already twelve barges in use and eight small odd ones. These latter will be disposed of as soon as the new vessels are constructed. The total cost of the new plant is estimated at £90,000.

Yarrow & Co.'s First Launch.—The completion of the transference of the well-known firm of Yarrow & Co. from Poplar-on-the-Thames to Scotstoun on the Clyde was emphasized on July 14th by the launch of the first vessel from the new establishment. This was the torpedo boat destroyer *Para*, built to the order of the Brazilian Government, and the first of ten similar vessels which Messrs. Yarrow contracted to build for the same destination. The *Para* is also noteworthy as being the heaviest vessel yet constructed by the Yarrow firm. She is 240 ft. in length and 23 ft. 6 in. in breadth. She will be fitted with two sets of triple-expansion four-cylinder engines, balanced on the Yarrow, Schlick and Tweedy system, and two double-ended Yarrow boilers, each boiler being about 4000 horse power. The *Para* is somewhat similar to the English river type of destroyer, but larger. Other three of the fleet of ten vessels are under construction on berths adjacent to the berth just vacated, one of which is not far from the launching stage. The other vessels will be launched in due rotation, and the berths vacated in turn will be taken up with the

remaining vessels of the contract. Messrs. Yarrow & Co.'s activity in this connection, taken in conjunction with the [illegible] Messrs. William D[illegible] and Bros., Dumbarton, marks an important development [illegible] is highly suited to carry on, and which our Admiralty for some reason or other has not availed itself of for many years as it might have done.

Prospective Naval Work.—Two items of news not without interest, and perhaps cheering significance, as associated with prospective naval shipbuilding on the Clyde, may be referred to. Mr. H. E. Deadman, late chief constructor and director of H.M. Dockyard Works, has joined the Board of the Fairfield Shipbuilding and Engineering Co., Ltd., Govan. Rear-Admiral J. E. Bearcroft, C.B., who for a good number of years past has acted as superintendent of H.M. ships building in the Clyde district, and whose term of service now expires, has been notified to hold himself in readiness to serve for another period of three years. The unusualness of this step would seem to warrant the hope that the Admiralty have under contemplation a good amount of ship construction for Clyde yards.

Notable Speed Trials.—The "measured mile" at Skelmorlie has, of late, been much requisitioned for the speed trials of important vessels notable for high speed, and the interest in this connection is bound to be heightened in the near future when the destroyer *Swift*, which has been built by Messrs. Cammell, Laird & Co., Ltd., Birkenhead, for the British Government, starts to test her powers of steaming at the extraordinary speed of from 36 to 38 knots. Amongst the vessels recently put through their paces were the new P. & O. 7000-ton liner *Salsette*, built by Messrs. Caird & Co., Greenock, and which attained the satisfactory speed of 19¾ knots as the mean of several runs, and the new paddle steamer *Bournemouth Queen*, built by the Ailsa Shipbuilding Co. (engined by Messrs. Hutson & Corbet, Glasgow), for the Southampton, Isle of Wight and South of England Royal Mail Steam Packet Co., Ltd. This vessel is 200 ft. long, 24 ft. moulded breadth (28 ft. 6 in. over sponsons), and attained on the trials a speed of 15½ knots, a result which is understood to be considerably better than was stipulated for by the contract. Still more notable is the performance of the turbine steamer *Ben-my-Chree*, built and engined by Messrs. Vickers, Sons & Maxim, Barrow, for the Liverpool and Isle of Man service. This vessel made a number of runs over the mile on the 7th July, the result of which was to show her thoroughly capable of the designed speed of 25 knots. She subsequently went upon a trial of six hours' duration at a maximum speed, the average of which, over this extended period, being officially reported at 25·34 knots. The experimental 36-knot destroyer *Swift*, above referred to, will be the fastest vessel in the world. She is a much bigger and more powerful boat than the *Cossack*, which is the only one of the 33-knot vessels hitherto seen on the Clyde. The *Swift's* displacement is about 1800 tons, and the horse-power of her turbine propelling machinery is nearly 30,000. She burns oil fuel exclusively. Whether the vessel will maintain the designed speed of 36 knots under severe Admiralty conditions remains to be seen, but a happy augury is that on a preliminary trial in the Mersey on the 8th July she did no less than 38 knots.

Sea-Going Motor Auxiliary Yacht.—What is claimed to be the pioneer ocean going vessel in this country fitted with a motor as an auxiliary to sail power, is the new auxiliary yacht *Modwena*, built by Messrs. John Reid & Co., Whiteinch, for Mr. Edgar Thornton, Ryde, Isle of Wight. Specially designed by her builders for far-away cruising the vessel is of 420 tons net register, and barque rigged with specially lofty spars. Her auxiliary machinery consists of a Gardner petroleum motor, capable of developing 200 horse-power. The motor is expected to be of great use in propelling the yacht through calms and also in leaving and entering harbours. On the "measured mile" at Skelmorlie, as the result of a number of runs, a mean speed of 9 knots was attained.

Shipyard Extensions.—The London & Glasgow Shipbuilding Co., Govan, are diverting the riverside pathway opposite their yard a little towards the river, so as to facilitate the construction of the large Orient liner presently on the stocks. On the completion of the vessel the pathway will be restored to its normal condition. The Clyde Trustees have begun operations at Merklands, Partick, in connection with the construction there of the new quay which is to be set back from the river the same distance as the cattle discharging wharf further down. The new wharf will be used for the berthing of vessels bringing cargoes of grain, and the Trustees are at present considering the question of what facilities should be provided on the wharf for discharging purposes. Messrs. Archibald McMillan & Son, Ltd., of the Dockyard, Dumbarton, have made the suggestion to the Dumbarton heritors that they be allowed to extend their yard by acquiring a portion of the churchyard adjoining. In a letter they say that with vessels of ordinary tonnage they have been obliged to take every advantage of existing accommodation, and the only way they can do so under existing conditions is to increase the depth of their yard between the river and the church. Accordingly they ask the heritors to sell a portion of the old churchyard.

Admiralty Torpedo Factory.—While declining to enter into any agreement, involving the payment of a fixed sum per annum, the Admiralty has agreed to take from the Greenock Corporation the whole of the electrical energy required for power and lighting purposes at the torpedo factory to be erected at Battery Park, Greenock, and to pay for same for a period of fourteen years from the commencement of the supply at the rates offered by the local authority. It is also agreed that the Corporation shall supply energy up to a maximum demand of 200 kilo-watts, with such increase as may be reasonably demanded, provided that the Admiralty give six months' previous notice of its requirements. The amount of current used at the existing factory in Woolwich exceeds, considerably, the equivalent of the maximum payment asked for by the Greenock Electricity Committee, and this amount will probably be increased when the plant is removed to Greenock. It is anticipated that the supply of electricity will not be required before about eighteen months hence. From this it would appear that the removal of the plant from Woolwich will be carried through in the leisurely manner characteristic of Government departments.

Weir's Pumps.—Messrs. G. & J. Weir, Ltd., Cathcart, Glasgow, whose fame is so specially associated with things marine, do not by any means confine themselves to this important branch of engineering. They have just completed their final installation of pumps on the pipe line through which, in future, the oil is to be brought down to the coast from the Burmah oilfields. This line is about 280 miles long, and there are twelve pumps in three sets of four each. Their power would probably surprise people who think only of the well-known Cathcart concern in connection with marine engineering. Pipe lines for oil are an American institution, and at one time our friends across the Atlantic had a monopoly of making them. They have no such hold on the business now, as this case illustrates, and an indication of a further decline to come is that the Burmah Oil Co. was induced to order this larger instalment by the success of other Weir pumps in use on their fields.

Testing Materials at Universities.—A proposal made at the last University Court in Glasgow to utilize the testing machinery in the engineering laboratory for the benefit of the University Fund has evoked a strong protest in one of the Glasgow dailies, apparently from a writer who has been trained in the University. He says that if it is intended to arrange for the taking in of materials from firms and to make a scale of fees for the testing of same he strongly protests. This work rightfully belongs to men who have finished their college course, and who are practising with laboratories of their own. No public educational body, either University or technical college, has any right to enter into competition with practising engineers or analysts. Apparatus such as is in the University should be kept strictly for educational purposes as was intended. The object of a University is to produce men competent to take up such work, and not to take that work out of their hands.

THE TYNE.

(*From our Own Correspondent.*)

The Outlook in Shipbuilding.—There is certainly no improvement in the freight market since we last dealt with this question, and the continued laying-up of steamers does not tend to brighten the outlook. There is no demand whatever for cargo-carrying boats, and if some of the big shipping companies require vessels for special service they

reluctance of even the most enterprising companies to give out orders may, perhaps, to some extent be accounted for by the labour disputes in the district; but making due allowance for this possible cause for hesitation, appearances generally seem to indicate that requirements are not particularly urgent. Foreign competition is steadily assuming more formidable proportions, and there is not the slightest reason to doubt that this hindrance to business in English shipyards will, as time goes on, prove still more menacing. As we have pointed out on a former occasion, the only counter move that can be made in defence of British trade is to produce more cheaply and more rapidly, for even the foreign shipowners will again come to this country to get their wants supplied, if they can get served more advantageously. The employers in the shipbuilding and engineering industries realize this perfectly well, and are doing all they can by the provision of improved appliances and the adoption of improved methods to keep in front of their foreign rivals. The workmen, however—or a very large section of them—seem to exist in a dreamland of their own, and never give a thought to the possibility of *all* work being driven out of the country, and they themselves being left with ample leisure to reflect upon their follies, *outside* the shipyards and the engine works.

An Array of Empty Berths.—The aspect of the majority of Tyneside yards is at the moment most depressing, for some of them have all their berths vacant, whilst others have as many as five out of six without occupants. Messrs. Armstrong, Whitworth & Co.'s yard, which up till now has kept quite busy, is apparently being affected by the prevailing slackness, as one berth, which was rendered vacant some eight weeks ago, still remains so. There are still five vessels on the stocks, but one or two of them are well advanced in construction, and it is feared that there will be no successors for these when they get launched. The adjoining yard—Messrs. Dobson's—is looking busier, there being four vessels in hand, two of which are of good size. It is reported that this firm has other work to put down when berths become vacant, but the report requires confirmation. Messrs. Wood, Skinner & Co. have on the stocks a vessel getting plated and one being framed. Two berths still remain vacant. The passenger steamer *Flora*, which is in the water, is now nearly ready for leaving, the extensive deck erections, as well as the elaborate internal fittings, being all but completed. Messrs. Swan, Hunter & Wigham Richardson have a very large proportion of their building space unoccupied, and this is a very ominous sign so far as regards the prosperity of the district. A large pontoon dock, recently launched, is receiving the finishing touches in the water, and there are also moored alongside the yards a number of vessels undergoing repairs. Messrs. Hawthorn, Leslie & Co. have two vessels quite ready for launching, but it does not appear that any preparations for putting them off are being made. There are a vessel in the graving dock and two or three in the water awaiting or undergoing repairs. Messrs. Stephenson have also a boat under repair in their graving dock, but have only one vessel building, the whole of the other berths in the yard being vacant. Further down the river the Palmer Co.'s yard has all its berths vacant, and at Messrs. Readhead's yard two of the four berths are without occupants. It may be stated, indeed, that the south side of the Tyne from Newcastle to Shields, presents an almost unbroken array of empty building berths.

On the north side things are not so bad. We have noted that at Low Walker the yards are fairly well occupied, and coming to Howden, we may state that the Tyne Shipbuilding Co. has only one out of the three berths vacant. This berth, however, is likely soon to be occupied, as a large stern frame for a vessel has just been delivered to the company, by the Darlington Forge Company. The Northumberland Yard has five vessels on the stocks, two or three of which are yet in early stages. Work appears to have been suspended some time ago on one of the vessels, but the plating has now been entered on and there will soon be work provided for riveters. In the lower reaches of the river repairing work is fairly plentiful, Messrs. the Smith's Dock Co. having, as is usual, the largest share.

In the Engine Shops.—By the aid of the foremen, the apprentices and non-society hands, a fairly satisfactory amount of work is being got through at the various engineering establishments, and in two or three instances vessels are now being fitted with their machinery. The ending of the purposeless strike which was entered upon early in the year is now in view, as the Steam Engine Makers' Society has made a direct appeal to the A.S.E. Executive to use their influence towards the restoration of peace, and this appeal can scarcely be ignored. There never was such flagrant

strike from the beginning, and for very shame the authors of it must be glad to bring it to an end.

Councillor Fowns, of the Fowns' Forge Company's works, Tyne Dock, has recently been speaking on the damage done to the English forging industry by unfair German competition. The damage is seen by the number of forges shut up, and Mr. Fowns calls for an enquiry. It is certainly time that something were done to save the remnant of this industry, but among the changes required to effect this purpose must be numbered a reduction of the wages rate to forgemen, which, Mr. Fowns says, reached the exorbitant figure of from £10 to £15 per week. Work at the Gateshead Railway shops is slacker than it has been for years, and overtime has been discontinued in all departments, whilst a considerable proportion are only working five days per week.

THE WEAR.

Shipbuilding.—Messrs. Doxford are said to have booked an order for a vessel lately, but no signs of resuming work in the west yards are, as yet, manifested. Large deliveries of material have, however, just been made at the yard. Messrs. Pickersgill are also understood to have booked an order, but it is, we understand, for a vessel of small size. Messrs. Robert Thompson & Sons have a large vessel in hand, which is said to be intended for passenger service. The firm have two others on the stocks, but the work on the latter appears to be temporarily suspended. They have also a small handsomely-equipped vessel in the water. The last vessel has been launched from Messrs. Laing's yard, and the huge establishment is now quite derelict, with the machinery standing. The two graving docks remain empty, although there are two vessels of the "Dale" line lying alongside and apparently requiring repairs. The whole of the yards "below bridge," including those at the South Dock, are slack, but one or two of the firms have some repair work in hand.

Engineering.—The vessel recently launched from the Deptford yard is receiving her machinery at Messrs. Dickinson's, Palmer's Hill, whose boiler department has, we hear, received an accession of work. Messrs. Geo. Clark & Co., of the Southwick Works, have become busier and have a very considerable force of men employed. The smaller engine works are, as a rule, very slack, and forges are doing very little. Amidst the prevailing slackness, there is one rather encouraging fact to be noted, namely that the North-Eastern Marine Works, South Dock, are still maintaining a satisfactory show of briskness, and are likely to be kept steadily going for some time yet.

MERSEY AND MANCHESTER SHIP CANAL.

(*From our Own Correspondent.*)

Ship Canal Traffic.—Traffic on the Manchester Ship Cana has considerably increased during the month. Cargoes of fruit have been specially prominent. Interesting facts and opinions on canal traffic come occasionally before the Royal Commission. Mr. Frank Impey, of Birmingham, in his evidence a fortnight ago, said with an improved canal the cost of conveying coal to London from the South Staffordshire district might be considerably lower than the lowest railway rate, and this would lead to a very large traffic in coal from the district.

Shipping Enterprise.—It is reported that Messrs. Fisher, Renwick & Co.'s Manchester-London Steamers Company has been reconstructed with an increased capital, under the style of "Fisher Renwick Manchester-London Steamers (1908), Limited," owing to its having recently enlarged its fleet by the building of new steamers more suitable for the trade between Manchester, London and Southampton, and the providing of additional facilities to wharves, etc., in London.

There has been no change in the management or proprietorship, Mr. Joseph Fisher and Mr. Geo. Renwick continuing to act as joint managing directors.

A Collision and its Result.—On the 3rd of April last, a collision occurred between the steam sand-pump dredgers *Sexta* and *Coronation*, belonging to the Mersey Docks and Harbour Board, and the steamer *Saragossa*. An action by the owners of the s.s. *Saragossa* followed. In the Court of Admiralty about three weeks ago, Mr. Justice Bargrave Deane said he was of opinion that the real difficulty in the case was shortage of steam. The fault had been with the vessel, and not with the pilot. If the pilot had had a proper head of steam the accident would not have happened. The *Saragossa* was alone to blame. Judgment for the plaintiffs with costs, the damages to be assessed.

Timber Imports.—Many cargoes of timber have been delivered at our Manchester Docks during the month from North America, Canada and the Baltic, besides consignments from the Continent. More vessels are still due.

Textile Machinery Exports.—The exports of British textile machinery have again resumed their upward course. The declared value for June was £710,075, compared with £610,367 in June, 1907. The total for the first half of the present year is £4,426,039. During the first six months of 1907 the total was £3,793,719. There are decreases to France, China, United States, South America, South Africa, Ceylon and Australia, with large increases to Russia, the central European countries, Japan, and the unenumerated countries and colonies, while India keeps up her large imports of spinning and weaving appliances. The figures for British India are £123,755, several thousands more than in June last year, and about £124,000 above June, 1906. Russia has increased from £11,511 in 1906, to £68,537 in June this year.

Cotton Trade Depression.—The present fall in the cotton trade reminds one of the action taken a little over four years ago by Mr. Macara, a noted Manchester cotton business man, who, with his colleagues, organized an international cotton federation in the hope of inducing all who are engaged in the trade to work together to avert dangers that can be efficiently faced by international action and by international action only. In the intervening years the organization has had wonderful success. It has spread through all the countries of Europe, and it has the co-operation of Japan, India and the United States. In the present crisis short time has had to be resorted to as a case of necessity. England, however, is not called upon to bear the whole of this burden on her own shoulders. America has been converted to the system, and Germany, Belgium and Portugal also have it in operation.

Importers' and Exporters' Association.—The Manchester Importers' and Exporters' Association have issued another circular, in which it is stated that the Council have discussed the question of shipowners' rebates, but decided to defer further consideration until the report of the Royal Commission on Shipping Rings is issued. An Australian and New Zealand section has been formed to consider matters relating to trade with these vast colonies. Attention has been called to the increased depth of the Manchester Ship Canal, and shippers urged to give Manchester the benefit of its geographical position when quoting "free on board" terms. Attempts are being made to secure new lines of steamships to and from Manchester to still further develop the trade of this important district of the country.

Depression in Trade at Liverpool and Birkenhead.—Birkenhead, like Liverpool, is suffering now, and has been suffering for some time past, from the sharp depression in trade. It is estimated that probably 10,000 skilled workmen and their labourers, chiefly in connection with the shipbuilding trade, are affected, 20 per cent. being unemployed, compared with 5 per cent. a year ago. Meanwhile engineers who find themselves out of employment are daily adding to the number of those who are anxious for sea berths.

Lighthouse Extinction.—On Tuesday night, 14th July, after over thirty-five years' lighthouse service, Mrs. Williams, of the Leasowe lighthouse, the only female lighthouse keeper known, kept her last watch, inasmuch as the Mersey Docks and Harbour Board have abolished the lighthouses of Leasowe and Lower Hoylake in favour of flashlight buoys in the Mersey estuary. For the last fifteen years Mrs. Williams did duty at the Leasowe lighthouse, being kept on at her husband's death until the extinction of the light.

Wireless Telegraphy in the Mersey.—The North-west lightship, twenty-six miles out from Liverpool, is being installed with the Marconi wireless telegraph apparatus, in order that communications may be maintained with the Bidston Hill Lighthouse, on the Wirral side of the Mersey, where a similar installation is to be provided, whence the messages are to be sent on to Liverpool by the ordinary telegraph or telephone. This arrangement was decided upon by the Mersey Docks and Harbour Board a few days ago.

Results of Brine Pumping.—During the year 123 applicants for compensation due to subsidences from brine pumping came before the Northwich Salt Compensation Board a few days ago. The total claims amounted to £7100, but the final allowances were £4600, which will be spent in property restoration.

Sir Percy Bates.—Sir Percy Elly Bates, of Messrs. Ed. Bates & Sons, shipowners and merchants, Liverpool, was, on the 17th July, elected to fill the seat on the Mersey Docks and Harbour Board vacant by the resignation of Mr. Aubrey Brocklebank.

Lancashire Iron and Coal Trades.—Trade in iron, both pig and manufactured, has been on the decline in the County Palatine during the month. Prices have receded considerably—the tendency is still downward. All trades, except in textile machinery, are dull without any prospects at present of betterment. Average prices are as follows:—Scotch pig, delivered Manchester docks: Eglinton, 58s.; Dalmellington, 57s.; Glengarnock, 59s.; Gartsherrie, 60s. 3d. per ton; 2s. 3d. less if landed at Heysham or Fleetwood, and 1s. less if shipped to Preston. Middlesbrough G.M.B., 59s.; Derbyshire, 51s. 6d.; do forge, 50s. 6d.; Staffordshire, 52s.; Lincolnshire, 52s.; do. No. 4, 51s. 6d.; do. forge, 50s. 6d.; hæmatites, East Coast, f.o.b., 57s.; do. West Coast, 58s.; billets, (English) £4 12s. 6d.; do. foreign, £4 8s.; good scrap iron, 55s. per ton. Manufactured iron: Iron bars, £6 5s. to £6 10s.; steel rounds, £6 5s.; flats, £5 17s. 6d.; angles, £5 12s. 6d.; joists, £6; channels, £5 17s. 6d.; tees, £6; iron hoops, £7 2s. 6d.; steel do., £7 to £7 5s.; steel boiler plates, £7 7s. 6d.; do. ship plates, £6. On the 1st July all sections of house coal were reduced 10d. per ton, but no change was made in other qualities, which remain on the same basis as fixed in September last. Business somewhat restricted owing to depression in cotton and iron trades and their branches. Quotations at the pits—best house coal, 14s. 6d. to 15s. 8d.; secondary, 13s. 2d. to 14s.; common, 11s. 2d. to 12s. 8d.; burgy, 10s. 6d. to 11s. 4d.; best slack, 9s. to 10s.; coal for shipping, 13s. to 14s.; f.o.b., at the tips. Coke cheaper.

THAMES.

(From our Own Correspondent.)

New Port Authority in Committee.—Evidence continues to be taken on this matter, and in view of its importance it is not surprising to find that between thirty and forty counsel are briefed, including many leaders of the bar, and that the costs work out at £3500 per day. It is difficult to say if real progress is being made, the witnesses taking opposing views. For instance, engineers have been called in to testify as to the value of the docks, and it is said in one case that 95 per cent. are in good order, while again it is given out that they are all antiquated. The contention was, owing to this, that the price to be paid was extravagant, and that this part of the Bill should go to arbitration. An actual decision arrived at is the constitution of the new authority. The elected members are raised to eighteen, and in the ten appointed members one is taken away from the County Council and given to the City Corporation, of the elected members seventeen are elected by the payers of dues, wharfingers and owners of river craft, and one by the wharfingers. Of the ten appointed members the following shows where they will come from:—

Admiralty	1
Board of Trade	2
L.C.C. (being members of Council)	2
L.C.C. (not being members of Council)	2
City Corporation (being a member)	1
City Corporation (not being a member)	1
Trinity House	[illegible]

The Committee have visited the docks and evidence was given by an accountant who assisted the Board of Trade. The conclusions arrived at were that the average income of the three undertakings acquired was £808,889 per year, and after paying interest on port stock there would be a surplus of £8893. There will be no sinking fund for ten years, and it was proposed to redeem the capital in eighty years, [illegible] year. The City Corporation remain the port sanitary authority under the new system, if the Local Government Board agrees.

Torpedo Vessels in the Thames.—An unusual interest was manifested in the flotilla of fifteen torpedo craft which came up the Thames recently in connection with the manœuvres. Several ascended as far as London Bridge, and naturally came in for great attention from all classes. One group of five that visited the port was 165 ft. long and steams at 25 knots. The vessels spent the week end in the river.

Steamship Co. Report.—Messrs. Furness, Withy & Co.'s report has been presented, recommending a final dividend of 5 per cent. after transferring £114,742 to depreciation account, with a balance carried forward of £102,315. The past year's profits showed an increase of £18,000 approximately on the previous year's working, the only department that suffered a loss being the shipbuilding one. The fleets of the two associated companies, the British Maritime Trust and the Chesapeake and Ohio Co., have been acquired by the company, comprising thirty-nine up-to-date vessels. Twelve new steamers have been built during the year for the service.

Thames Steamboats.—This matter has again appeared at a discussion by the London County Council of a proposed syndicate to charter the Council's vessels and run a modified service, but presumably the necessary capital was not forthcoming, and the matter has been apparently dropped. The service to be inaugurated was of a limited character, and to be to Greenwich.

Imperial Science College.—A meeting has been held of the Royal Commission of 1851 under the presidency of the Prince of Wales, and the report of the Board of Management recommends the appropriation for the purpose of the Imperial College of Science and Technology of the site on the Commissioners' estate at South Kensington, which had been reserved for the proposed Institute of Medical Science, and the existing buildings of the College will be linked together with those to be erected. The College will, as we know, be for the purpose of higher education in applied science.

Training Ships on the Thames.—The annual prize distribution has been held on board the *Arethusa* at Greenhithe, and Mr. Klein, the chairman, stated that last year fifty-eight boys entered the Royal Navy and 113 the Mercantile Marine. Sir W. White, in the course of an address to the boys, regretted that with our ships so numerous boys from countries like Denmark and Norway were entering them instead of English, and that this was a matter of the deepest regret.

The Installation of Lord Warden of the Cinque Ports.—Dover made an imposing demonstration at the installation of Lord Brassey to office. All the details of the ancient ceremony were fully attended to. In returning thanks the Lord Warden mentioned that we owned one half the ships of the world, and that therefore our supremacy was undeniable. At the luncheon which followed at the Town Hall it was noted there had been an increase in tonnage since the days of the Plimsoll Commission from seven millions to eighteen millions, while in the meantime the loss of life at sea had decreased from 7000 to 1000 annually.

NORTH-WEST OF ENGLAND.

(*From our Own Correspondent.*)

Barrow-in-Furness.

Engineering Work.—As soon as Vickers' Company became thoroughly established in Barrow it was found by that firm that the accommodation in respect to houses was insufficient, and that it was debarring many artisans from settling in the town. The first thing that they did was to buy the old ocean greyhound the *Alaska* and turn it into a large lodging-house. This was not a great success, and eventually the firm decided to build houses on the Isle of Walney, which is on the other side of the channel, opposite to where their launching ground is. Under the name of the Isle of Walney Estate Co. they commenced building on a large scale. When they commenced operations there was a population on the island of about 300. Now the population is 5000. Huge schools have had to be built, three churches have been built, and at last, through the energy of Vickers' tenants, a fine bridge across the channel was opened on the 30th of last month by the Mayoress of Barrow. It is a most imposing bridge, and has been built by Sir William Arrol & Co. It consists of eight fixed spans and one opening span. The opening span is a bascule bridge similar to the Tower Bridge, London, although operated in a different way. The two leaves are not on pivots, but roll back on great quadrants. The opening occupies thirty-five seconds, and the closing forty-five seconds. The bridge is 1123 ft. long and has a width of 50 ft. The opening span is 136 ft. wide and the machinery is driven by electric power. The contract price was £87,000, but the Corporation who are building the bridge have borrowing powers for £152,000. It was from the designs of the late Sir Benjamin Baker. Another difficulty to overcome by Vickers was the width of the entrances to the docks. Some years ago Sir John Aird & Co. deepened one of the sills to the extent of 6 ft., and this gave a deeper approach to the fitting-out wharf. Still that was not sufficient. The width of the entrance to the Buccleuch and Devonshire Docks was only 75 ft., and this was not sufficient for Vickers, who specialize in big craft. The result was that it was decided to widen the Buccleuch Dock entrance to 100 ft., and as it was not considered safe to widen the Devonshire Dock entrance, owing to the fact that the foundations of the heavy 200 lifting bridges would be interfered with, Vickers' placed orders for the construction of a new wharf in the Buccleuch Dock. It is notable that these schemes brought together in Barrow three of the most famous engineers in the world, *viz.*, Arrols on the bridge, Sir John Aird & Co. on the widening of the Buccleuch Dock Bridge, and Sir John Jackson's Co. on the new wharf. This is a record for any town. The old Buccleuch bridge is on the swing principle and was useless for the extra width, so Handysides, of Derby, are at the moment fitting up a bridge on the bascule principle similar to the ones on Walney bridge, but instead of there being two there is only one. The new wharf will be one of the finest in the world. It has great length, the dock has been dredged to a great depth and a 150-ton capacity electric cantilever crane has been constructed. This crane can deal with two ships lying alongside each other, as will be the case when the *Vanguard*, the British "Dreadnought" of the *St. Vincent* class, and the *St. Paolo*, the much-discussed Brazilian "Dreadnought," are launched. It has been such vessels as these which possess great breadth that has rendered the widening necessary. It will be seen from this engineering work that Vickers have done much for Barrow in the way of rendering the docks capable of accommodating anything. There is still one thing that is necessary to complete the accommodation, and that is a large dry dock capable of taking the largest ship afloat or likely to be afloat in the next score of years or more. All big vessels built at Barrow have to dry dock either on the Mersey or the Clyde, and that means extra expense. A large dry dock would be a great boon, but the cost of construction is standing in the way, and the Furness Railway have to be considered. Of course, since Vickers' have become interested in Beardmores on the Clyde the need is now not so keen, for all the vessels have to go to the Clyde to undergo trials. Still one in Barrow would be a great thing for the port and is bound to come in the long run. Vickers' do not believe in standing still.

Trade.—The shipbuilding trade is not so brisk and many men have been paid off. The joiners and wood workers are very slack, for the departure of the *Ben-my-Chree* and the *Rathmore* finished that class of work and other ships are not so far advanced as to provide employment for them. It was rumoured that Vickers' had booked an order for one of the London and North-Western and Lancashire Railway steamers which run between Fleetwood and Belfast. Two are needed, and they are above the average as regards the size of channel steamers. It is said that Swan, Hunter's, on the Tyne, were the lowest in the tendering and that Vickers' were the next. If that is so, and it comes from a very reliable source, it looks as if Vickers' would get an order. One may

go to the Clyde, and if that is so Barrow will miss it. On the other hand, Barrow have built several before for this combination, and these have given splendid results, so there [illegible] and submarine craft. A programme like that will require [illegible] Admiralty, who renamed them the *Triumph* and *Swiftsure*, but the price of those, even if the money was locked up, will not pay for all the above. It is confidently forecast that the Chilian Government will order something shortly, and if they do Vickers' will probably get a good share. Then, again, it is said that Mexico are likely to place an order for a warship, and that Vickers' are to be the favoured people. They have just completed the *General Guerrero*, a transport-cruiser, and some of the Mexican officials are staying in Barrow after the departure of the vessel, so there seems some reason for expecting that Mexico needs something else.

The "Ben-my-Chree."—This magnificent turbine express passenger steamer has been completed and has run her trials. She was delayed some five weeks by the lock-out, but when the men returned to work the joinering, etc., was pushed on with. Probably no cross-channel steamer in the world has caused as much interest. She was a record vessel in every way. She was of brilliant design and it is the general opinion in Barrow that not a smarter or finer lined vessel has been turned out. She left Barrow on the 6th of last month and proceeded to the Clyde for her trials. The builders were soon putting her through her paces and her trials should have been completed on the Wednesday, but after doing four hours of the six at a record speed she ran into a bank of fog and the vessel had perforce to be pulled up. Fog and storm kept her until Saturday, when in fresh weather she had another try. The trial was most successful. Although the weather was not of the best, it may be remarked that a lifeboat put out to a vessel in distress off the Isle of Man the same day the *Ben-my-Chree* did her six hours and accomplished an average speed of 25·34 knots per hour. She proved herself a remarkably clean boat in heavy seas, at this speed, and what is more there was practically an entire absence of vibration. The saloon cabins are forward the engines, and in these there was none at all. In the second-class cabins abaft the engines it was scarcely to be felt. The boat had been stiffened in such a way as to stop the distressing vibration. The scantlings were heavy, in fact, heavier than was originally intended. Since finishing her trials this vessel has been on the Liverpool service for two days, and on the heavy traffic from Scotland consequent upon the Glasgow fair. She has been doing some fine speeds, and on more than one occasion has carried her full comple- [illegible] knots. It is expected that she will almost daily beat this speed. There is one interesting point in connection with the *Ben-my-Chree's* trials. She had just come off the measured mile and was doing about 26 knots when her engines were stopped and [illegible] strain was very great, but the vessel stood this remarkable test—for it must be understood that lightness is considered to a great extent with this class of vessel—and gathering stern speed she went on the mesaured mile again, doing 17 knots, being steered by the bow rudder. She was turned round and put stern first again, and this time she almost reached 18 knots. Captain Keig, the commodore-captain for the Isle of Man Steam Packet Co., was in command of her when she was put through stiff manœuvring tests, all of which she passed through easily.

One thing has been proved in connection with the running of this vessel's turbines, and that is the benefits that accrue from working at not too high a pressure. It had been first thought that 230 lbs. to the square inch would be suitable but after careful thought it was agreed that 170 would be the best. At the lower pressure the superior working and power of the turbine has been proved beyond all doubt.

The "Rathmore."—The London and North-Western Railway steamer has passed her trials successfully, accomplishing her contract speed of 20 knots. She has been on the Dublin service for nearly a month now, and is giving excellent results. For the size of this vessel there is scarcely another [illegible] was used, and everything that was put into her was of the very best.

A Novel Steamer.—Vickers' launched a novel steamer during last month. Some time ago they booked an order for two submarines for the Japanese navy and these are now nearly completed. The question to be faced was how these two vessels could be taken out to Japan. To sail them would almost have been impossible. To take them in sections would not have been satisfactory, so it was decided to build a cargo vessel that would carry them out whole. This vessel, which has no name at present, is about 260 ft. long and has a very wide beam. She is not handsome, but has the appearance of being a very handy cargo steamer. She will carry about 2000 tons. The engines are aft and are not a great power—just sufficient for her class. Both her engines and boiler were built on the Clyde. When this steamer is finished and the two submarines are ready for shipment, the whole three will proceed to the Mersey, where in one of the dry docks the hatchways and deck will be removed, the steamer will be submerged, and then the two submarines floated over her. Water will be pumped out of the dock, and as it subsides the two submarines will settle into special cradles built in the steamer's hold. The steamer will then be floated, the decks made fast and she will proceed to Japan. When she has delivered her cargo, which will be the reverse to the procedure at the Liverpool dock, this steamer may come back to Barrow and be used for carrying Vickers' guns, mountings, etc. But if a customer can be found out East she will be sold. Altogether it is a very novel thing, and it will be watched with interest by the shipbuilding and shipping world.

The "Vanguard."—Vickers' are bidding for records in the construction of H.M.S. *Vanguard*. She is growing marvellously on the stocks. Nothing is being left to chance, and when she is launched at the back end of this year it will be found that scarcely any builders at all have equalled the Barrow firm in smartness. She will be the first vessel at the new wharf.

The "St. Paulo."—The Brazilian "Dreadnought" is growing a little, and it is expected that she will come off the stocks in March of next year. It is said that when complete she will be the heaviest "Dreadnought" afloat, of course, excluding her sister ships building on the Tyne. The latest rumour is that the British Admiralty are going to buy them. Britain will not unless she is compelled, for these vessels, big as they are to be, are contrary to the Admiralty's standard of efficiency. Barrow hopes that they are for Brazil, for if that is the case then the other South American powers will want some to keep up their ends.

The "Manxman."—During the time that the Midland Railway express steamer *Manxman* was lying up at Barrow in the off season she was overhauled and her propellers were altered somewhat. The result has been that she is now reeling off a speed greater than ever she did. On her service it is said that she is getting 24 knots. The improvements to the propellers are due to a slight alteration on the pitch.

Floating Dock for Fiume.—Vickers' launched a floating dock built to the order of Whitehead's torpedo works, Fiume, Austria, at the beginning of the month. This dock is about 229 ft. long. The Liverpool tugs *Blazer* and *Storm Cock* towed her out of port, and it is expected that the voyage will last about a month. The dock, which was on the Clark and Stansfield's principle, consisted of the usual two walls and possessed all the latest designs in this class of structure.

Floating Crane.—There was launched by the Vickers Co., on the 17th ult., the hull for a 75-ton floating crane. The hull has been built under Lloyd's survey and rules. When complete it will be towed across the Atlantic to Canada, where it is to be used on the lakes and canals. The firm of Applebys are building the crane. The dimensions are length moulded 200 ft., breadth 43 ft., depth 10 ft.

West Coast Hæmatite.—The iron and steel trade is practically at a standstill, and during the month two furnaces have been put out of blast. The Barrow steel works are closed with the exception of the hoop works. In West Cumberland Moss Bay have a few orders for rails and Cammel, Lairds have restarted their No. 1 rail mill, but the orders are few and the prices not high. Moss Bay secured £5 17s. 6d. per ton for 90's. Prices for iron are down and now stand at about 58s. per ton f.o.b. for mixed numbers. Warrant

iron is about the same price, net cash settlement. Stocks [illegible]

Shipping.—Shipping is in consequence of the slump in iron and steel very poor. The exports of iron and steel for west coast ports for this year are almost a quarter of a million tons below the aggregate for the same period of 1907. This is a very serious fall, and as there does not seem to be any prospect of improvement in the trade this year's total looks like creating a record for lowness. Very little iron ore from Spain or Algeria is being imported.

SOUTHAMPTON.

[illegible]

The Royal Mail Steam Packet Co. have purchased the refrigerated hulk *Duleep Singh*, which has been stationed at Gibraltar for some years. We understand she will be brought to this port for alteration and overhaul, after which she will be towed out to the River Plate for service in the Argentine meat trade.

The P. & O. Co.'s steamers *Assaye* and *Sicilia* will shortly be removed from this port in consequence of the Admiralty's decision not to re-engage these vessels for transport work. The *Assaye* has already left her moorings off Netley and come into dock and has discharged ballast to ship coal. It is possible that certain structural alterations will be executed at this port, after which she will sail for London to take up her position in the Co.'s sailing list. She is due to leave the Thames on the 21st of this month.

The Southampton, Isle of Wight and South of England Royal Mail Steam Packet Co. have just added the handsome paddle steamer *Bournemouth Queen* to their fleet. The vessel was constructed by the Ailsa Shipbuilding Co., Ltd., at their Troon yard, and the engines are by the well-known firm Messrs. Hudson & Sons, Ltd., Glasgow. The vessel is 200 ft. long and has a beam of 24 ft. She has lofty and spacious lounge and dining saloon and is fitted with electric light throughout, and has been designed to meet all Board of Trade requirements for the Co.'s passenger service to Bournemouth, Boscombe and Swanage. The vessel attained a speed of 15½ knots on the measured mile and has engines of the diagonal compound surface condensing type, with cylinders 23 in. and 48 in. dia., with a stroke of 51 in. Steam is supplied by a large return tube cylindrical boiler having three furnaces and working at a pressure of 130 lbs. per sq. in. There was an entire absence of vibration when running at full speed. The upper deck extends the full length of the vessel, giving an uninterrupted promenade nearly 200 ft. long. The vessel has been designed to give accommodation for 704 passengers, and this with comfort and convenience. The internal fittings are very elaborate and the panelling in dining saloon and approach to same on main deck is of polished mahogany and oak, whilst in the ladies' saloon the panelling is mahogany and American ash. The lounge is upholstered in light green velvet and furnished with fixed revolving chairs.

Messrs. Day, Summers & Co.—The auxiliary steam yacht *Valhalla*, whilst entering the dock, collided with the dock wall and was dry-docked for repair. The repairs included cutting and scarphing on a new portion to the stem bar, also three shell plates were renewed. The tugboat *Emily*, recently constructed for the Rio de Janeiro Lighterage Co., has successfully completed her steam trial, when a speed of 10·75 knots was maintained over the measured mile. The vessel sailed for Rio on the 20th of last month.

Repairs are in progress on the Isle of Wight S.P. Co.'s *Vectis*, which broke her paddle shaft. A new shaft is being supplied and fitted.

Messrs. Harland & Wolff were very busy last month, during which the American liner *Philadelphia* and the Red Star Liners *Kroonland* and *Finland* were dry docked here for general overhaul. We understand the four White Star Liners are also to be dry-docked on arrival.

John I. Thornycroft & Co., Ltd.—The trials of H.M. first-class torpedo boat No. 20 having been satisfactorily passed, preparations are being now made for handing over at an early date. H.M.S. *Amazon*, ocean-going torpedo boat destroyer, is now being prepared for launching, after which her trials will be proceeded with. H.M. first-class torpedo boats Nos. 31 and 32, which are of the same class as H.M. first-class torpedo boats Nos. 19 and 20, are now well advanced in construction. H.M.S. *Nubian*, a vessel similar to H.M.S. *Amazon* (of the *Tartar* class ocean-going destroyer), is now well in hand on the stocks.

Besides the foregoing torpedo craft there are several vessels under construction at these works, including five twin-screw cargo steamers being supplied to the order of Argentine customers. The vessels are 220 ft. in length and will be sent out to South America under their own power. Other work includes repairs to H.M.S. *Redwing*, H.M.S. *Ant*, dockyard pinnaces, and launches; s.s. *Lycidas*, *Eros*, *Satellite*, etc., etc.

BELFAST.

[illegible]

SEVERAL important shipbuilding orders have recently been secured by the Belfast shipbuilders, and there is every prospect of trade being fairly brisk for some considerable time to come.

Messrs. Harland & Wolff have received from Messrs. Bibby Bros. & Co., of Liverpool, an order for a large twin-screw steamer for their Marseilles, Egypt, Colombo, Rangoon and Burmese service. The Bibby Line's entire fleet—the well-known "shires"—has been built at the Queen's Island, and, although the superiority of the accommodation on the existing vessels of the fleet is such as merits the highest approval of travellers, it is intended that the new vessel will eclipse the others in equipment and comfort. Her length will be close on 500 ft.; beam, 60 ft.; and registered tonnage about 8000. The Queen's Island firm is also said to have contracted to build a twin-screw steamer 420 ft. long for Messrs. M'Ilwraith & M'Eacharn & Co. On the 27th of June the steamer *Lapland*, built by Messrs. Harland and Wolff to the order of the Red Star Line, was launched from the north end of the Queen's Island. The new vessel will be the largest sailing under the Belgian flag, having a length of 620 ft. by 70 ft. beam, and 59 ft. deep, with gross tonnage of about 18,000. The total number of passengers and crew provided for will be nearly 3000. The propelling machinery consists of two sets of quadruple-expansion balanced engines. The 150 tons floating crane which is being built for Messrs. Harland & Wolff is nearing completion, and should be ready for testing in two or three weeks' time. The 100 tons crane belonging to the Harbour Commissioners, and situated at the Alexandra Wharf, was, not so many years ago, looked upon as being one of the finest and largest cranes in the kingdom, and yet, to such huge dimensions has the Atlantic liner grown, that this crane is only lofty enough to put in the lower portions of the funnels in the leviathans constructed at the Queen's Island, the upper strakes of plating having to be built up in place. This trouble will, of course, be entirely got over when the new floating crane is in operation.

Messrs. Workman, Clark & Co.—On the 25th of June this firm launched from their North Yard a steamer named *Perseus* for the Ocean Steamship Co., Ltd. (Messrs. Alfred Holt & Co., Ltd.). The *Perseus*, which is a vessel 460 ft. long, with a gross tonnage of 6800, is the first of two steamers recently ordered by this company from the same builders. It is also worthy of note that she is the seventeenth vessel built by this firm for the Ocean Steamship Company. The steamer *Parismina*, the second of the steamers built this year by Messrs. Workman, Clark & Co. for the United Fruit Company, of Boston, is at time of writing undergoing speed trials on the Clyde.

Repair Work.—Although one or two fairly big repair jobs have recently been dealt with in Belfast, yet there has for some time past been no great run in this class of work. Messrs. Workman, Clark & Co. have in graving dock the Belfast steamer *Bangor*, on which they are carrying out extensive bottom damage repairs. Messrs. MacColl & Co. have the local steamer *Eveleen* in hands for damage repairs.

JUNIOR ENGINEERS.

Boring Machines.

ALTHOUGH small parts are frequently bored in the lathe, the inconvenience of chucking and centring large and heavy castings renders the operations more easily performed on some sort of boring machine, where the work is stationary and the drive and feed motions are given to the tool. With parts that are more or less symmetrical, such as propeller bosses and small cylinders, or excessively long, as stern tubes and shaft liners, the lathe is usually employed, with the face-plate in the former case and with a boring bar in the latter. The lathe is also more adaptable where the bore is large in relation to the depth, such as pistons and piston rings, and particularly so where, as in these instances, the internal and external surfaces must be accurately concentric.

The boring and turning mill is in effect a face-plate lathe with the difference that the plate is horizontal instead of vertical, and for heavy work this machine has special advantages and its extreme rigidity renders it a useful adjunct to the machine plant. The circular table is supported in a footstep bearing at a convenient height above the floor level and rotated by means of gearing from a countershaft. The tool box is fitted to an overhead horizontal slide, supported at opposite sides of the table by vertical standards after the style of the planer bridge, and cross and vertical feeds are arranged for in a manner similar to that of the planer attachments. Usually two toolboxes are mounted on the cross slide, and in the larger models a separate tool box is fitted to each of the vertical slides. With capstan heads holding five or more tools it is possible to perform external and internal roughing, finishing and screwing without stopping the machine, and, by virtue of the simplicity of setting the work, two machines can be operated simultaneously.

The methods in use from which the present types of horizontal boring machines have been produced may still be seen in some small repair shops, where a boring bar is set between the lathe centres, the work being clamped to a movable bracket fitted to the slide rest; the capacity of the lathe for this work is obviously limited by the height of the centres, and hence the necessity for a larger vertical range of movement. One very common form of boring machine based on the face-plate principle is largely used for boring and facing valve chests, small brackets and cast pipe flanges. The headstock containing the driving and feed gear is adjustable for height, the forward and cross feeds being operated by screwed spindles through the bed, which, fitted upon slide bearings, supports the work. The faceplate of the machine is provided with V slides to which the toolbox is fitted, a cross-feed is thus also given to the tool, the limit of which is equal to the radius of the faceplate.

In other types of machines the feed motion is given to the boring bar, which is fed out of a sleeve spindle by a screw, rotated either mechanically or by hand. The large horizontal machines adopted for boring turbine cylinders are operated on this principle, the cylinder being clamped to the rigid bed while the boring bar is fed through. In this case the weight of the boring bar is supported by means of a steady bracket at the outer end. For small diameters the tool can be fitted direct into the bar, a square hole and clamping screw being provided for this purpose; for large bores, however, the spring of the tools would cause "chattering" and unevenness of surface, so that a tool holder is clamped to the bar into which the tool is fitted. The tool holder may be in halves with semicircular ends for gripping the bar, with a feed screw passing through the tool box for adjusting to the diameters. With long bars it frequently becomes necessary to support the middle portion, as well as the ends, this being done either by means of a bushed steady bracket, in which the bar revolves, or by clamping a bracket to the bar, the ends of which bear upon the surface of the bored portion while revolving.

In boring out large cylinders horizontally, there is a tendency for the walls to sag down and thus slightly distort the bore, and hence the vertical machine is adopted where it is specially desired to maintain a truly parallel bore, albeit the more usual practice is to employ the horizontal machine rather than install a tool more or less special to one class of work. In some cases it is an advantage to have two horizontal boring machines accurately aligned with one another, side by side, and adjustable for various distances between the spindles, so that parts can be machined accurately parallel where two bores are contained in one casting, or where, as in feed and bilge pumps, two or more cylinders may be bolted together.

The distinction between boring and drilling, which is usually drawn, is that in the former case a hole has already been formed either by punching the forging or coring the casting, while in the latter case the hole is formed direct from the solid material by means of a drill, a tool having two cutting edges instead of the single one of the boring tool. The machines are also widely different in their functions and characteristics, the speeds of rotation of the driller spindle are considerably higher, and where the horizontal type of machine is the most useful for boring operations, the vertical driller has fully as large a field as the horizontal. For heavy work the latter is the more suitable where, as in drilling holding-down bolts in cylinder, column and bedplate feet, the holes are far apart and not easily accessible. In such cases the long traverse necessary is obtained by erecting a vertical slide against the shop wall to which the spindle carriage is fitted. The small types of the horizontal machine are adapted to machine the smaller parts that are still too unwieldy to be placed on the table of the vertical, or are too long to suit the distance of the floor to the spindle. The vertical machine is of lighter build, adapted for drilling and tapping the smallest parts, chests and pipes, the sensitive drill being employed when the required limits of fineness cannot be reached by the comparatively heavier machine.

PARAGRAPHS.

Automatic Drain Valve.—Among the many small details in connection with the main and auxiliary machinery, attention to which makes for economy, drain cocks or valves and their outlets rank high. The importance of good drainage is manifest when starting or working the engines out and into port, while also the saving of fresh water is an item which has to be considered in arranging the outlets, as these may become a source of loss unless provision is made to save the water coming from them. Our attention has been directed to a style of automatic drain valve termed the Berchem, which seems to fulfil an important function; it is neat and compact, and being automatic in its action serves to keep the steam free and dry, removing the risk of damage by water-hammer, with the obvious advantage that no hand manipulation of a drain cock is necessary.

Gauge Glass Protectors.—The risk to engineers due to gauge glasses breaking at inopportune moments has been greatly minimised during the last fifteen to twenty years by the improvement in the manufacture of the glasses and the fittings. There have been unhappily several accidents resulting in damage to the eyesight or the loss of an eye; such cases have served as beacons of warning to engineers to exercise the greatest care in approaching the glasses and manipulating the valves or cocks. Simultaneously with the demand for an improvement in the glasses to meet the higher steam pressure and temperature, the gauge glass protector was placed upon the market and was to some extent adopted to lessen the cause as well as the disastrous consequences of glasses breaking. The cost of the protectors has been heavy, and their adoption has not been so universal as otherwise it would have been, and it is well, therefore, that manufacturers have met the situation by the improved glasses and the accidents have been fewer of late years. Our attention has been called to a protector to which has been given the distinctive name of "Vulcan," this has the merit of a lower cost than has hitherto been the rule. The design of the protector is similar to those which have been before us for some years, the improvement lies mainly in the reduced cost of production and thus commending it to a larger area of customers.

Messrs. S. T. Taylor & Sons have covered boilers, pipes, etc., of the s.s. *Haigh Hall* with "Tynos" non-conducting material.

CORRESPONDENCE.

We do not hold ourselves responsible for the opinions of our correspondents.

British Electro-technical Commission.
Sub-Committee on Symbols.
Symbols for Physical Quantities.

To the Editor of the MARINE ENGINEER AND NAVAL ARCHITECT.

Dear Sir,—I have been asked by the above Committee to submit to the technical and scientific press a statement as to the possibility of creating a number of new symbols to represent physical quantities. The object of the publication of this statement is to invite the criticism of writers, readers and printers of scientific literature.

It is very desirable to have a notation for the representation of physical quantities in scientific books and periodicals, which shall be the same in all languages.

The subject is under the consideration of the International Electro-technical Commission with a view to international agreement, and committees in the different countries (in England under the chairmanship of Lord Rayleigh, O.M.) are discussing this particular subject. They are dealing more especially with symbols for electrical and magnetic quantities, but the system might with advantage be extended to embrace all important quantities in physical science, especially as the subject is receiving the attention of most technical societies with a view to some action being taken in the matter.

There are, however, two great difficulties which arise when we try to fix upon a standard notation.

The first is the difficulty of persuading a number of writers and readers who have become accustomed to a certain symbol for a certain quantity to change it in favour of an equally large number of writers and readers who have become accustomed to another symbol. For instance, in France and Germany, the letter "I" commonly represents the strength of an electric current, while in England and America "C" is more commonly used.

In the second place, there are not enough letters in the two or three alphabets at our disposal to give a distinct symbol to each quantity, without resorting to the combination of more than one letter to form a single symbol. There is a great objection to this combination of letters, because the use of sub-script letters and numbers is required for distinguishing between particular quantities of the same general kind. If, for instance, C represents current, C_a might conveniently represent armature current, and C_1 the current in circuit No. 1. It would, therefore, not be good to take C_a to represent capacity, or any other quantity other than an electric current.

There is, moreover, an objection to using letters at all to represent quantities in a universal notation, because, unless initial letters are used, there is no connection in the mind between the letter and the quantity, and the symbol is difficult to remember. We cannot always use initials, because the initial letters differ in different languages. For instance, in England "R" commonly stands for resistance, while in Germany it is more convenient to use "W" for *widerstand*. Moreover, the same initial occurs for a great number of different quantities. For instance, "R" might stand for Resistance, Reluctance, Reactance, Radius, etc.

One way of avoiding the above difficulties would be to create a number of new symbols which could be printed by means of type like ordinary letters, and which would represent each physical quantity in a distinctive manner.

The question, however, arises as to whether a number of entirely new symbols would be acceptable to writers, readers and printers alike, and the Sub-Committee on Symbols appointed by the British section of the Commission has requested the writer to place his views publicly before the profession, with a view of obtaining suggestions and criticisms as to the feasibility of such a scheme from as wide a circle as possible.

In choosing a symbol, we would try to make a very simple picture of something that reminds us of the quantity in question. For instance, ⌡ might represent temperature. If we were told that this simple outline of a thermometer represents temperature, we would have no difficulty in remembering it. Similarly / might represent Force, and the various "Forces" might be derived from it; for instance ϟ electromotive force (conventional representation of lightning); and ∩ magneto-motive force.

It is not my purpose here to say what would actually be the best form of symbol for each quantity, but it is not a difficult matter to devise very simple characters which can be written quickly, easily and with sufficient accuracy, and which can at the same time assist the memory to connect them with the quantity for which they stand.

What would the printers say to the new type? The author has taken up this matter with a very large publishing firm, and is assured by their chief expert that 200 or 300 new type would be a small matter to a modern printer, who is already accustomed to deal with many hundreds of different founts, each of which contains from 30 to 120 different symbols. He estimates that a printer in a large way of business has at his command as many as 60,000 distinct type, differing from each other either in letter, size, body or face. The addition of 200 or 300 more would be a drop in the ocean. The size of the new type could be standardized for most purposes, and it would only be in some special case that another size would be called for.

The setting up of the formulæ with the standard size of type would be simpler than with the present system, in which sub-script letters are often unnecessarily introduced. One symbol under the present system sometimes consists of four or five letters.

If it be admitted that the introduction of new symbols is advisable, the question arises what shall the new symbols represent exactly? Shall the sign ⌡ (Temp.) represent Temperature in any units, or shall it represent the number of degrees of temperature, measured by some scale agreed upon, and embodied in the definition of the symbol. If the system of units employed be not prescribed, fewer symbols would be required, and the general writer who now says vaguely "Let T equal the temperature," would find the symbol sufficient for his purpose. But from the reader's point of view, there is much to say in favour of a symbol which will embody in its definition a standard system of units. Any formula expressed in such symbols would be completely self-contained, and would be an exact statement of a physical fact. Until the units employed in any formula are known, the formula expresses only half its meaning. Perhaps some slight addition to the symbol, or even to the whole formula, might be used to indicate that the standard system of units is employed. Without that addition, the symbol would have a general meaning. For instance, ⌡ might equal Temperature, while ⌡ might indicate the degrees centigrade above the absolute zero. The name of the type might be the name of the physical units which it represents; for instance, for ϟ we might read "volts."

If writers, printers and readers, who have any definite views as to the best method of devising a system of symbols, would communicate with the technical press, or with the author, they might assist in solving the many difficulties which arise in connection with this matter.

MILES WALKER.

Altrincham, July 17th, 1908.

DRAWING FOLIO.—Mr. A. E. Battle, who is well known as an author and teacher of marine engineering, has made what appears to us a distinct advance in an educational sense by the introduction of this work. We know the difficulty engineers at sea, for whom this is intended, have in the drawing portion of their examination. They cannot very well learn this subject in a few lessons. Practice is required, and this folio being of some dimensions, with T and set squares and scales complete, a candidate has practically everything here to enable him to exercise himself. The drawings are to a fair scale and number forty-four. The system is to give plenty of explanation in addition, and only the necessary application is required for a student to do the rest for himself, with the instructions found here. Among the articles of which drawings are found, we notice practically everything of importance connected with a marine engine, and there is ample information as to the rules governing each sketch with B. of T. regulations and the necessary elementary principles. The whole is contained in a neat case.

LAUNCHES AND TRIAL TRIPS.

LAUNCHES—English.

Corbet Woodall.—On June 27th, Messrs. S. P. Austin and Son, Ltd., launched from their shipbuilding and repairing establishment at the Wear Dock Yard, Sunderland, the steel screw steamer *Corbet Woodall*, 100 A1 in Lloyd's Register, which has been built to the order of Messrs. Stephenson, Clarke & Co., of London, and is the fifth vessel constructed for the same owners. She is designed to carry about 1,260 tons deadweight on a light draught and is specially adapted for the owners' coal trade. Accommodation for the captain and officers is provided in a short bridge, and for engineers alongside the machinery. The machinery will be supplied by the North-Eastern Marine Engineering Co., Ltd., and deck machinery, including steam windlass and steam winches, by Clarke, Chapman & Co., Ltd., and steam steering gear by Davis & Co., Ltd., will be supplied with steam from a Blake multitubular boiler. The construction has been carried out under the superintendence of Mr. T. S. Hunter, on behalf of the owners, and the vessel was gracefully named by Miss Hunter of Dormansland, Surrey.

Celia.—On June 29th, the steam fleeter *Celia*, built to the order of Messrs. Hellyers Steam Fishing Co., Ltd., Hull, was launched from the yard of Earle's Shipbuilding and Engineering Co., Ltd., Hull. The dimensions of the vessel are : Length, 111 ft. 3 ins. ; breadth, 22 ft. 6 ins. ; depth, 12 ft. 10 ins., moulded. She has been constructed under Lloyd's survey for 100 A1 class steel, and has two large ballast tanks for trimming purposes, and is also provided with the usual trawling outfit for this type of vessel. The accommodation includes a mess room on deck aft for crew. The naming ceremony was performed by Miss Marie Pike, of Brixham, and amongst those present were Mr. Chas. Hellyer, Mrs. Hellyer, Miss Marjorie Hellyer, Mr. F. Somerscales, Mr. and Mrs. Tyacke, Mr. Palethorpe and Mr. Sturrock. After the launch the party proceeded to the offices where breakfast was served. Mr. Somerscales wished success to the ship and her owners. Mr. Hellyer, in responding to the toast, referred to the good feeling that existed between his firm and Earle's Co., and expressed himself well pleased with the way in which the Company had met his requirements and carried out the work. The *Celia* is the first of four fleeters Messrs. Earle's are building for the Hellyer's Steam Fishing Co., Ltd.

Saranac.—On June 29th, Messrs. William Gray & Co., Ltd., launched at Hartlepool the handsome steel screw steamer *Saranac*, which they have built for the bulk petroleum trade for the Anglo-American Oil Co., Ltd., London. She will take Lloyd's highest class and her dimensions are : Length overall, 400 ft. ; breadth, extreme, 51 ft. 9 ins. ; depth, 30 ft. 3 ins. ; with long full poop and forecastle. The engine and boiler-room are in the after part of the vessel, and underneath them there is a double bottom for water ballast. The forward and after peaks are also fitted for water ballast for trimming purposes. Forward of the boiler-room there are twelve strong transverse bulkheads and also a very strong fore and aft bulkhead from the keel to the upper deck. The bunkers are arranged as tanks for oil fuel and in addition there are twenty separate oil tanks. These are separated from the boiler-room aft and from the cargo holds forward by coffer dams carried to the upper deck in each case and can be filled with water when required. Expansion trunks are carried full length of tanks between main and upper decks to allow the oil to rise and fall with varying temperatures. Two powerful pumps are fitted in the pump-room amidships for discharging the oil cargo. They will also pump water from the sea to fill the oil tanks when required for water ballast. A powerful fan will be fitted, capable to exhaust the air from and to thoroughly ventilate each compartment, the exhaust air being delivered a good way above decks. The vessel will be fitted throughout with an electric light installation for lighting all compartments in the vessel and for working the cargo. Two separate engines and dynamos are fitted, each capable of producing the whole of the lighting required. The rooms will be all heated by steam so as to avoid risks of fire. The accommodation for captain, officers, and the saloon, etc., is in fore part of poop and the engineers' rooms in after part of poop and the crew forward. The vessel has a powerful combined hand and steam-steering gear fitted direct to the rudder, patent steam windlass and capstan, large marine type donkey boiler, three large winches and all necessary outfit for the oil trade. Two masts will be fitted and neatly rigged, and awnings over all accommodation. Great care has been taken to ensure strong and sound work, riveting is closely spaced in shell plating, decks and bulkheads, and part of it in the bottom and shell was done by hydraulic power, and in order to reduce as far as possible the number of joints in way of the oil tanks, the shell plates are extra long. The vessel will be fitted with a powerful set of triple-expansion engines of specially heavy design, manufactured at the Central Marine Engine Works of the builders, and having cylinders 27 ins., 43½ ins., and 73 ins. diameter by 48 ins. stroke. Steam will be generated in three large cylindrical, single-ended return tube boilers, adapted for a working pressure of 180 lbs. per square inch. The engine-room is replete with all the latest improvements, including Weir's feed pumps, evaporator and feed heater, Paul's circulating pump coupled to an independent main condenser, Railton & Campbell's feed filter, Snow's ballast donkey, Snow's air and circulating pump, worked in conjunction with Morrison's "Contraflo" winch condenser, Aspinall's governor and Crompton's ash hoist. The ceremony of naming the steamer *Saranac* was gracefully performed by Mrs. Powell, wife of Mr. F. E. Powell, one of the directors of the Anglo-American Oil Co. There were also present at the launch Mr. F. E. Powell, director, Mr. Archibald McLean, manager of the shipping department, Mr. G. Hume, superintendent, and others.

Bedouin.—On July 1st, this vessel was successfully launched by Messrs. Joseph L. Thompson & Sons, Ltd., of the North Sands Shipbuilding yard, Sunderland, and has been specially constructed to the order of Messrs. The Bedouin Steam Navigation Co., Ltd. (Messrs. W. & R. Thomson, managers), Liverpool. The principal dimensions of the vessel are : Length, 420 ft.; breadth, 51 ft. 6 ins.; depth, 29 ft. 3 ins. ; and the vessel has been designed to have a large deadweight and measurement carrying capacity, on a moderate draught of water. The vessel has been constructed under special survey on the Strengthened Spar Deck rules to Lloyd's highest class. Provision is made for carrying an exceptionally large quantity of water ballast, the whole of the cellular double bottom right fore and aft, also both the fore and after peaks, being arranged for this. The 'tween decks, poop, bridge, topgallant forecastle, and the accommodation houses have been made specially high. Accommodation for the saloon, and spare berths, officers, engineers, steward, etc., is fitted in large roomy houses on the bridge deck, and the chart house and captain's room are constructed over the saloon house, with the steering house built on top of the chart house. The crew and firemen are berthed in the poop, and the petty officers, apprentices, etc., are accommodated in the topgallant forecastle. The vessel is rigged as a two-masted fore and aft schooner with steel lowermasts and wood telescopic topmasts, to suit the Manchester Ship Canal. A complete complement of deck machinery and derricks will be fitted to facilitate the rapid handling of cargoes, the deck machinery being supplied with steam by a large multitubular marine type donkey boiler working at 180 lbs. pressure. A complete electric light installation will be supplied and fitted by Messrs. The Sunderland Forge and Engineering Co., Ltd., Pallion, Sunderland. The engines and boilers have been constructed by Messrs. George Clark, Ltd., of Sunderland, the sizes of the cylinders being 25½ ins., 42 ins., 69 ins., by 48 ins. stroke, supplied with steam by two large boilers working at 180 lbs. pressure. A large company witnessed the launch, which was most successful in every way, the model of the ship being very much admired. When completed, the vessel will be an excellent specimen of the modern up-to-date cargo carrier. The company included Mr. William Thomson, managing director of the owner's firm, Miss Thomson, who gracefully performed the christening ceremony, Miss Daisy Thomson, Mrs. Joseph A. Thompson, Miss Armstrong, Miss Andrea Boro, of Christiania, Mr. George F. Mason, who has superintended the construction of the ship and engines, Mr. Cod and Captain Owen, who will take command of the vessel, and the builders' representatives. After the launch, the company adjourned to the builders' luncheon, where the usual toasts were duly honoured.

Mervyn.—On July 14th, Messrs. Wm. Pickersgill & Sons, Ltd., launched from their shipbuilding yard, Southwick, Sunderland, a finely-modelled steel screw steamer, specially designed for the mineral trade, and to a full specification. Dimensions : length, 286 ft. ; breadth, 43 ft. ; and depth

21 ft. Machinery and boilers are being supplied and fitted by Messrs. Geo. Clark, Ltd., Southwick. The owners are Messrs. Martyn Martyn & Co., of Newport, Cardiff and Bilbao During construction the vessel has been under the supervision of Mr. J. J. Richards, Cardiff. As the vessel left the ways she was gracefully christened *Mervyn* by Mrs. G. R. Martyn, wife of the senior partner.

Papelera.—On July 14th, Messrs. Osbourne, Graham and Co. launched from their yard at Hylton, the steel screw steamer *Papelera*, which they have specially constructed for Messrs. Fearnley & Eger, of Christiania, being the second vessel they have built for this firm. She is built on the single-deck principle, with short poop, long bridge, with all accommodation on top. Rooms for the captain and officers are very handsomely fitted out in hardwood, and of large size. The vessel carries 2,700 tons on a shallow draught, and is equipped with the most modern appliances for economical and quick working of cargo. She is built under special rules to Norske Veritas survey, and complies with the requirements of the Sjofartskontaret rules. Water ballast is in both peaks and throughout double bottom, thus enabling steamer to take long passages light, with the greatest safety. The vessel was gracefully christened by Mrs. Johannessen, wife of Captain Johannessen, who has superintended the construction of the steamer. Engines and boilers will be supplied by Messrs. George Clark, Ltd., and have been constructed under the personal superintendence of Mr. Waitz, of Christiania.

Petroleine.—On July 14th there was launched from the yard of the Tyne Iron Shipbuilding Co., Ltd., of Willington Quay-on-Tyne, a steel screw steamer of the following dimensions, *viz.*, length, 362 ft.; breadth, 48 ft. 6 ins.; depth, moulded, 30 ft. 6 ins. The vessel, which has been built to the order of Messrs. The Saxoleine Steamship Co., Ltd., (Messrs. Hunting & Son, of Newcastle-on-Tyne, managers), is designed for the purpose of carrying petroleum and other oils in bulk and is built to the highest classification in Bureau Veritas for this type. She is fitted with a very complete pumping installation, having a treble system of oil piping to deal with the different classes of oil carried. The machinery, which has been constructed by Messrs. The Wallsend Slipway and Engineering Co., Ltd., consists of engines having cylinders 26 in., 42 in., and 70 in. by 48 in. stroke, with three single-ended boilers, working at a pressure of 180 lbs. On leaving the ways, the vessel was named *Petroleine* by Mrs. Forbes Tulloch, of Eachwick, Northumberland. During construction the vessel and engines have been under the inspection of Mr. John Muir, the owners' superintendent.

Sir Walter Scott.—On July 15th, the Blyth Shipbuilding and Dry Docks Co., Ltd., launched from their Shipbuilding and Graving Docks Works the fine steel screw steamer *Sir Walter Scott*, built to the order of Messrs. John O. Scott & Co., Newcastle-on-Tyne. This vessel, which measures 255 ft. in length, with a beam of 36 ft. 9 in., has been constructed under Lloyd's Special Survey to class 100 A1. She is of the raised quarter-deck type, having long bridge and topgallant forecastle. The accommodation for captain, engineers and officers is provided in bridge, whilst crew will be berthed in topgallant forecastle. The *Sir Walter Scott* is specially adapted for the coal, ore and timber trade, having extra large self-trimming hatches and clear holds, together with the best and latest design of deck machinery for the quick and economical working of the cargo. The vessel is supplied with a Cochran (Annan) donkey boiler with patent seamless furnace. Triple-expansion engines of good power will be supplied by Messrs. The North-Eastern Marine Engineering Co., Ltd., of Sunderland. As the vessel glided down the ways, the christening ceremony was gracefully performed by Lady Scott, wife of Sir Walter Scott, Bart. An adjournment was afterwards made to the offices of the shipbuilders, when the success of the *Sir Walter Scott*, her owners and other toasts were honoured. The hull and machinery have been constructed under the supervision of Mr. Norman Burnett, of Newcastle.

Delta B.—On July 16th, there was launched from the shipyard of Messrs. Cochrane & Sons, shipbuilders, Selby, a handsomely modelled steel screw trawler, the principal dimensions being 120 ft. by 21 ft. 6 in. by 12 ft. 3 in. moulded. The vessel has been built to the order of Messrs. The Société Anonyme "Delta," of Brussels, and will be fitted with powerful triple-expansion engines by Messrs. Earle's Shipbuilding and Engineering Co., Ltd., of Hull, and is replete with all the latest improvements for fishing purposes. As the vessel left the ways she was gracefully christened *Delta B* by Miss Cochrane, of Hull, after which the company adjourned to the builders' offices, where the customary toasts were given and responded to.

LAUNCHES—Scotch.

Sabbia.—On June 30th, the Clyde Shipbuilding and Engineering Co., Ltd., Port Glasgow, launched a steel screw steamer, 315 ft. by 46 ft. 3 in. by 23 ft. 4 in., for the Navigazione Libera Triestina Société in Azioni, of Trieste. The vessel has been constructed to Lloyd's highest class under the superintendence of Mr. J. Baxter, of Newcastle-on-Tyne, and Captain Olivetti, the company's representative, and was named *Sabbia* by Miss Welch, Clunebank, Port Glasgow, and immediately after the launch was placed in the Company's dock to receive her machinery, which has also been constructed by the builders.

Makura.—On July 14th, there was launched at Linthouse, the large twin-screw steamer *Makura*, built to the order of the Union Steamship Company, of New Zealand, Ltd., by Messrs. Alex. Stephen & Sons, Ltd. She will take up the Company's service between New Zealand, Australasia and Vancouver. Her dimensions are: Length, 470 ft.; breadth, 58 ft.; depth, 35 ft.; and while principally designed for passengers, will carry a considerable amount of cargo, the holds being worked by hydraulic hoists, a system of cargo gear almost universal on the Australian coast in the best steamer lines, and similar to those fitted in all the steamers built by Messrs. Stephen for the Colonial trade. Part of the cargo space has been fitted to take refrigerated cargo, frozen meat, butter, etc., or chilled fruit, the refrigerating machinery being on the Hercules ammonia system. The passenger accommodation is very extensive, and includes first, second, and third-classes, all the fittings being of the best type of their respective classes. The first-class passengers, in number about 220, are situated amidships; and special attention has been paid to heating, lighting and ventilation, as the vessel passes from tropical heat to severe frost during her voyage from New Zealand to Vancouver. The heating is on the electric system with heaters in every room, while the ventilation is on an unusually efficient natural system, assisted by a complete range of exhaust fans, which draw the vitiated air from each room, while, in addition, the new system of ozonair purifier has been fitted. The saloons, lounges, dining, music and smoking rooms, which are all situated on the upper decks, are large and lofty, and decorated in excellent taste by the builders. The necessary pantries and bars, etc., are arranged in close proximity to the saloon, and a special pantry has been fitted alongside the lounge for the dispensing of afternoon tea or other refreshments. The lavatories and bathrooms are very extensive, and are fitted with showers, plunges, etc., for use in hot weather, while a barber's shop has been provided, having all the latest electric appliances. The upper deck opening off the lounge forms a spacious playground for exercise or games, and on a deckhouse overlooking this are placed the captain's and officers' accommodation. The second-class are arranged aft, with the dining saloon in the poop, and the music and smoking rooms above, while the third-class are situated forward, with similar saloons and other rooms. All the public rooms throughout the ship are panelled in hardwood and handsomely upholstered. The crew generally have been arranged to be clear of the passengers, the firemen occupying a space aft, with separate rooms for each watch, the space allowed for each man being well above Board of Trade requirements, a special galley and a sheltered space for taking the open air, while the seamen are placed forward, and the engineers are in a long range of rooms amidships abreast of the machinery. The boiler power is ample for the high speed required, and the engines—which have also been constructed by Messrs. Stephen—are twin-screw and of the four-crank type, and in order to reduce vibration to a minimum, they are balanced on the Schlick-Tweedy system. The outfit of auxiliaries is very extensive, as is necessary for a vessel of this class. The electric engines are fitted in triplicate, to cope with the unusually complete system of lighting and heating, and to reduce to a minimum any chance of a breakdown. The boats are fitted with Welin's davits, Mill's disengaging gear, and Captain Cameron's patent boat chocks. A steam launch is also provided, for

service when lying off some of the intended ports of call. The vessel, which has been built to British Corporation rules, has been constructed under the supervision of Mr. J. R. Campbell, the Union Company's superintendent, with the assistance of Captain Livingstone, Mr. Wallace, etc. We understand the vessel has been chartered to take passengers out to Melbourne, and is expected to sail towards the end of September with a full complement. The christening ceremony was gracefully performed by Mrs. J. M. Ritchie, wife of Mr. J. M. Ritchie, director of the Union Steamship Company of New Zealand, Ltd.

LAUNCH—Irish.

Lapland.—On June 27th, the launch of the fine large steel screw steamer *Lapland* took place at Belfast. It is an event of considerable importance to shipping and international commerce. The *Lapland*, the latest and most notable addition to the Red Star Line, has been constructed at Messrs. Harland & Wolff's yard and will be a fit companion to the other leviathans of the deep that are constantly being turned out at that establishment. She will be by far the largest vessel sailing under the Belgian flag, being over 620 ft. long by 70 ft. beam, and 50 ft. deep. Her tonnage will be about 18,000 and displacement about 30,000. The vessel is being built in accordance with the requirements of the British Board of Trade and the American and Belgian Laws for passenger vessels, her construction thus illustrating that development of international commerce and unity which the Red Star Line has done so much to promote in its important services between Antwerp and New York, Philadelphia, etc. The name of the vessel—*Lapland*—is also well-chosen (as with the other vessels of the line), adding significance to the community of interests with which this well-known Company is identified in its commercial relations. The *Lapland* will be a worthy link in the chain of commerce which is binding ever more strongly together the old world and the new in ties of mutual interest and interdependence. The *Lapland* is designed to carry a large quantity of cargo and a large number of passengers—first, second and third-class—for all of whom accommodation on the most approved principles will be provided—in fact, the new vessel in every respect will represent the highest excellence of the shipbuilder's art. The *Lapland* is an exceptionally strong vessel, having nine decks and being built on the cellular double bottom principle, the double bottom extending the whole length of the ship, the depth of the inner vertical keel being 4 ft. 6 in. throughout, excepting under the engines, where it is increased to 5 ft., the object of this, of course, being to give still greater rigidity in the vicinity of the machinery. The vessel has ten watertight bulkheads, being thus divided into eleven watertight compartments. There is also a centre-line bulkhead in the cargo holds and 'tween decks. The double bottom, of course, in addition to being an element of strength and security, provides space for water ballast, which is also carried in the fore and aft peaks. The arrangements for cargo are of the most approved kind. There are six cargo holds, and the bunkers are arranged so that the vessel can be completely coaled from either side. When completed, the *Lapland* will be a very sightly vessel, with four masts and two funnels. The cargo derricks are of the tubular type, and the other appliances for working ship and cargo are also of the latest pattern. The first-class state-rooms in the *Lapland* are placed on the two uppermost decks and will be exceptionally spacious and airy. They are situated on the shelter deck forward and the bridge deck, and a feature in connection with this accommodation is the number of one-berth rooms. There are also cabins arranged *en suite*, with private lavatory and bathroom adjoining. Moreover, all upper berths in first-class state-rooms are folding berths, which gives a more roomy and tidy appearance than the ordinary arrangement. The first-class saloon is situated on the main deck forward. It is a handsome apartment, the decoration consisting of panelled work, finished flat white, relieved with carving and old gold. The room will seat 320, the tables being arranged on the popular restaurant principle. In this room a balcony has been arranged over the centre, with accommodation for a band, which will discourse music during meal times, as in the Continental cafés. The first-class lounge and reading room, also the smoke-room, are on the promenade deck. The lounge is in oak, and the smoking room is also in oak, with Dutch tiles. The reading room will be in white, of very artistic design. The first-class entrance is in panelled oak, with ceiling of special design and handsome glass dome. There are also artistic glass domes over the smoke-room and reading room, greatly adding to the attractive character of these apartments. The second-class state-rooms are on the shelter and upper decks, and the second saloon on the main deck aft. This is also a very fine apartment, decorated in white relieved with gold, and will seat 220 passengers. The second-class library is on the bridge deck, and the smoke-room on the promenade deck. The permanent third-class accommodation is on the main deck aft and the upper deck, including a great number of enclosed cabins. The total number of passengers and crew provided for will be nearly 3,000, and, in addition to the other attractions of the vessel, the different classes of passengers will have the benefit of large clear promenading spaces. In the first and second-class this is specially noticeable, and the third-class passengers will have a sheltered promenade forward, the forecastle being given up entirely to them—in fact, all the arrangements have been conceived on the most generous scale, with the object of meeting the requirements of the respective classes of passengers. The first-class passengers will have the benefit on the upper promenade deck of the introduction of an arrangement of large frameless plate-glass windows along the sides, doing away with the old canvas screens, the passengers thus having a covered-in promenading space without any interruption in their view of the horizon. The windows can be lowered and kept in any position by an ingenious arrangement of springs, making the deck an ideal promenade. The vessel will have a refrigerating installation for provisions and a complete system of cold storage. Special attention has been given to the heating and ventilation, which will be as perfect as mechanical ingenuity can ensure. The passengers' comfort has also been specially studied in arranging the galleys and pantries, with a view to the rapid and efficient serving of meals, also in the provision of an electric elevator for conveying passengers from one deck to another. The vessel will be fitted with the latest and most improved Marconi system, and will also have a submarine signalling apparatus. The steering engines and gear are of Harland and Wolff's latest type. This gear, with which, by means of an ingenious arrangement of steel springs, the shocks and strains on the rudder are minimised, has long been regarded as an important element of safety in a ship. The propelling machinery consists of two sets of quadruple-expansion engines arranged on the "balanced" principle, which has been so successful in eliminating vibration.

Messrs. Matthew Keenan & Co., Ltd., covered boilers, pipes, etc., on the *Mourilyan*, built by Messrs. Alex. Stephen & Sons, Ltd., and the *Orcona*, built by Messrs. W. Beardmore & Co.

Cochran (Annan) donkey boilers with patent seamless furnaces have been supplied to the S.S.'s *Kildin*, *Milos* and *Ben-my-Chree*.

TRIAL TRIPS.

Westerwald.—On July 2nd, this fine vessel, which has been built by Furness, Withy & Co., Ltd., at their Middleton Shipyard, Hartlepool, proceeded on her trial trip and exceeded the contract speed of 12 knots. The vessel is a very fine sample of naval architecture, and we must compliment the celebrated Hamburg-Amerika Line on their usual foresight in determining the most up-to-date class of vessel for the special trades in which they are engaged. This ship is beautifully fitted up and is specially adapted for carrying first-class passengers and better class emigrants to and from the West Indies. Every provision has been made for the comfort of the passengers and emigrants, great care having been taken with the ventilation, electric fans being fitted in each passenger berth, saloon, ladies' room and smoke-room. The vessel is well on to 400 ft. in length and has two complete decks, with long bridge poop and forecastle. In the bridge amidships is fitted the accommodation for the first-class passengers, engineers, purser, stewards, stewardesses, etc., also the galley, bakery, baths, lavatories, etc. The main dining saloon, ladies' saloon and smoke-room are situated in lofty houses on the bridge deck, and on top of the saloon house is a large teak house containing accommodation for the captain and officers; above this is the chart and wheel-house, the top of this house being over 62 ft. above the keel

of the vessel. The 'tween decks all fore and aft are fitted up with galvanized iron berths for emigrants, all the necessary wash-houses, hospitals, shower baths, etc., being included. The vessel has two masts and two derrick posts, and for dealing rapidly with general cargoes there are eleven powerful steam winches, and seventeen patent tubular steel derricks, including two each of fifteen tons capacity. Eight large boats are fitted on the boat deck which extends the full length of the bridge amidships, these boats being carried on patent tubular davits. For carrying the necessary provisions, wines, etc., for passengers a very elaborate arrangement of refrigerating machinery and provision rooms has been fitted up in the after end of the ship. The electric installation consists of two direct-coupled engines and dynamos and over 300 electric lamps are distributed throughout the ship. A very powerful steam steering gear (Sivewright's patent) is fitted in a large house on the poop, with telemotor gear to the captain's bridge amidships. The whole of the auxiliary machinery for this vessel has been manufactured at the Middleton Shipyard, Hartlepool. The engines, which are of the tripleexpansion type, have been constructed by Messrs. Richardsons, Westgarth & Co., Ltd., Hartlepool, and have cylinders 25½ in., 43 in. and 72 in. diameter with o stroke of 28 in. The high-pressure cylinder is fitted with a piston valve and the intermediate and low-pressure cylinders with balanced slide valves. All the shafting is of ingot steel, and the propeller shaft is covered with a continuous gun-metal liner. The propeller is of manganese bronze. For controlling the speed of the engines a governor is fitted and connected with the throttle volve. There is a Weir's contact feed heater and the engine-room auxiliaries are very complete, including general purpose, fresh - water and ballast pumps, feed-water filter and evaporator, etc. A novel feature in connection with the whistle is an electric gear adopted by the Hamburg-Amerika Company, by means of which the whistle can be automatically sounded at intervals. Steam is supplied to the main engines and auxiliaries by three single-ended boilers, 14 ft. diameter by 12 ft. long, working at a pressure of 200 lbs. per square inch and arranged with Howden's system of forced draught. An ash ejector is fitted in the stokehold and an additional two-cylinder ash hoist. The machinery throughout is of very substantial and massive design. During a six hours' continuous full speed run the main engines, refrigerating plant and the whole of the auxiliary machinery worked most satisfactorily, the vessel attaining an average speed of 13½ knots. The owners were represented by Mr. Eggers, Mr. Rotharat, Captain Sachse, and Mr. Viereck; the ship builders by Mr. H. Withy, Mr. R. W. Vick and Mr. G. W. Sivewright; the engineers by Mr. L. D. Wingate and Mr. Urquhart; Mr. W. J. B. Casley represented the Germanischer Lloyd. After the trial trip the vessel proceeded to Hamburg under the command of Captain Dugge.

Leeds City.—On July 7th, the steamship *Leeds City*, built by Messrs. Ropner & Sons, Ltd., of Stockton-on-Tees, made her official trial trip in the Tees Bay. The steamer has been built to the order of Messrs. W. R. Smith & Son, Cardiff, and is fitted with the builder's patent improved trunk deck. She has been built to the highest class in the British Corporation Registry. The vessel is 370 ft. in length, and has a deadweight carrying capacity of about 7200 tons. Her outfit is thoroughly up-to-date, and includes stockless anchors, quick-warping steam windlass, steam-steering gear amidships and powerful screw gear aft, whilst she is particularly well equipped with derricks and winches of the most modern type, in order to facilitate the loading and discharging of cargoes. The accommodation for captain and officers is provided for at the after end of trunk, the engineers being housed amidships and the crew in the forecastle as usual. Her engines are of the triple-expansion type of about 1850 I.H.P., by Messrs. Blair & Co., Ltd., of Stockton. The vessel has been built under the superintendence of the managing owner, Mr. W. R. Smith, and the commander, Captain W. Story, and on trial she behaved herself in a thoroughly satisfactory manner. The owners were represented by Mr. W. R. Smith, the engineers by Mr. Walter Borrie, and the builders by Mr. J. R. Garthwaite. After some very satisfactory trial runs, during which the vessel attained a speed of over 11 knots, she proceeded on her run round to Cardiff, her loading port.

Iolanda.—On July 10th, the steam trials of the magnificent new American twin-screw steam yacht *Iolanda* (of which we gave particulars in our April issue, page 382), 1817 tons Thames measurement and designed by Messrs. Cox & King, London, were completed on the Firth of Forth under the most favourable conditions, at first on the measured mile at Gullane and afterwards at sea as far as the Isle of Man. A fresh easterly breeze was blowing with a slight swell, which thoroughly tested the yacht's sea-going qualities, and as steam was got up a series of runs were taken which showed that with the engines working at only half power a speed of 14½ to 15 knots could easily be attained. On the full power trial, with all boilers working, a speed of 18·76 knots was easily obtained with the engines indicating about 3500 H.P. This result was considered very satisfactory and was considerably above what was expected. The *Iolanda* is now in Leith Roads fitting out for an extended foreign cruise, which her owner, Commodore Marton F. Plant, of the New York Yacht Club, intends commencing next week. On account of her great size and the exceptional character of her accommodation and fittings the *Iolanda* has attracted much attention during her construction, and she is probably the finest and most important steam yacht which Messrs. Ramage & Ferguson, Ltd., have yet built at Leith.

Modwena.—On July 11th, the new auxiliary yacht *Modwena*, which has been built at Whiteinch by Messrs. John Reid & Co., Ltd., for Mr. Edgar Thornton, Ryde, Isle of Wight, ran her trials on the Firth. Among the company on board were Mr. and Mrs. Thornton and a party of friends. Rain fell heavily during the day, but otherwise the conditions were favourable. The trials on the measured mile were in every way satisfactory, a mean speed of nine knots being attained. The yacht has been specially designed by her builders for far-away cruising, and is the pioneer ocean-going vessel fitted in this country with a motor, which is expected to be of great use in propelling her through calms and also in entering and leaving harbours. Of 400 tons Thames yacht measurement, and built to Lloyd's highest class, the *Modwena* is a splendid looking vessel, barque rigged and with huge towering spars, while her auxiliary machinery consists of a Gardner petroleum motor capable of developing 200 horse power. There is accommodation fore and aft for a large number of guests, while amidships there are several state rooms, the officer's quarters and a large dining saloon. The vessel is fitted up in a sumptuous manner throughout, the furnishings of the dining saloon and the writing-room being specially handsome. After the trial the *Modwena* anchored in Gourock Bay, where her unusual and graceful appearance attracted considerable attention. The interesting vessel left the Clyde the following day for the Solent.

Styliani Bebis.—On July 15th, the steamship *Styliani Bebis* (of which we gave particulars in our June issue, page 461), left the Tyne for her official trials. She has been built by Messrs. Short Brothers, Ltd., of Pallion, Sunderland, for Messrs. C. D. Bebis & Sons, of Piraeus. The trial trip was in every way a success, the machinery working smoothly throughout and a mean speed of 10 knots being attained with a full cargo on board.

Bida.—On July 16th, the twin-screw passenger steamer *Bida* (of which we gave particulars in our July issue, page 490), built by Messrs. W. Harkess & Son, Ltd., Middlesbrough, had a successful trial trip in Tees Bay. She was loaded with a full cargo of 1200 tons, which she carries on a draught of 12 ft., and she steamed an average 10½ knots speed. The vessel was inspected prior to her departure by Sir Alfred Jones and party, who expressed their entire satisfaction with the vessel. She has been built to a full specification for Messrs. Elder, Dempster & Co.'s branch service on the West Coast of Africa, has handsome accommodation for a limited number of first-class passengers, and carries Board of Trade certificate for a large number of deck passengers. On completion of her trials the *Bida* proceeded on her voyage to Nigeria.

Falk.—On July 20th, the fine new steel screw steamer *Falk*, built by Messrs. W. Dobson & Co., Low Walker-on-Tyne, to the order of Mr. Alf. Monsen, Tonsberg, Norway, completed her official trip off the Tyne. This vessel, which has been built to the highest class at Norske Veritas, is of the single-deck type and of the following dimensions, *viz.* :—Length between perpendiculars, 280 ft.; breadth, 40 ft.; depth moulded, 20 ft. 8 in. She is fitted with all the latest improvements and facilities, for the rapid loading and discharging of cargo. The propelling machinery, which has

been constructed and fitted by Messrs. the North-Eastern Marine Engineering Co., Ltd., at their Northumberland Engine Works, Wallsend-on-Tyne, consists of a set of their latest type of triple-expansion engines having cylinders $20\frac{1}{2}$ in., 33 in. and 54 in., with a stroke of 36 in., steam being supplied by two large steel boilers working at a pressure of 180 lbs. per square inch. During the trial run the machinery worked without the slightest hitch, giving great satisfaction to all concerned, and maintaining a good speed. Amongst those present were Mr. H. Dobson and Mr. W. Dobson, representing the shipbuilders, Captain Gundersen, representing the owner, and Mr. J. Daglish representing the engine builders.

Oratios Couppas.—On July 21st, the steel screw steamer *Oratios Couppas* (of which we gave particulars in our June issue, page 461), built by Messrs. Craig, Taylor & Co., Ltd., Stockton-on-Tees, to the order of Nicolas Couppa, Esq., of Marseilles, was taken to sea for her trial trip, which proved highly satisfactory. The machinery, constructed by Messrs. Blair & Co., Ltd., Stockton-on-Tees, during the whole of the trial trip worked with the greatest smoothness, and a mean speed of 12 knots was maintained on the two runs over a six miles course. The vessel has been built under the superintendence of Mr. William Law, Liverpool, and Mr. George Condouris, Cephalonia, and these gentlemen, who were both on the trial trip, together with Mr. Couppa, the owner, expressed themselves as being very highly pleased with both the ship and engines. After the trial trip the vessel proceeded to Cardiff to load, under the command of Captain Carandinas. This is the third vessel which Messrs. Craig, Taylor & Co., Ltd., have built for the same owner.

Jervaulx Abbey.—On July 22nd, the finely modelled steel screw steamer *Jervaulx Abbey*, the second vessel built by Messrs. W. Gray & Co., Ltd., West Hartlepool, to the order of Messrs. The Hull and Netherlands Steamship Co., Ltd., Hull, for their fast daily service between Hull and Rotterdam, was taken to sea for her official loaded trial. The vessel takes the highest class in Lloyd's Register, and her dimensions are: Length overall, 265 ft.; breadth, 33 ft. 8 in.; and depth, 16 ft. 3 in. She has a full poop, raised quarter deck, long bridge, and topgallant forecastle; a handsome saloon, smoke-room and cabins for 44 first-class passengers amidships; accommodation for 28 second-class passengers in the poop and 44 steerage passengers forward. The ship is lighted throughout by electricity and fitted with electric bells and steam heaters. Stalls are provided for carrying forty horses. The hull is built with deep bulb-angle frames, a cellular double bottom and peak tanks, large hatchways, five steam winches, steam-steering gear, steam capstan aft, steam windlass, and a complete outfit for a first-class passenger and cargo steamer. The machinery was made at the Central Marine Engine Works of the builders. The engines have cylinders $25\frac{1}{4}$ in., $40\frac{1}{2}$ in., and 67 in. diameter, with a piston stroke of 42 in., embodying special features to give the required power to drive the vessel over 15 knots per hour. The three large boilers, of the Central Marine Engine Works' well-known type, with flanged shell, adapted to work at a steam pressure of 185 lbs. per square inch, and fitted with Howden's system of forced draught and internal feed heaters, supply ample steam to maintain the desired speed. The engine room is replete with numerous auxiliaries for adding to the efficiency of the machinery. An exhaustive trial extending over 200 miles was made at full speed starting from Hartlepool; the 200 miles as registered by the log was covered in 13 hours 16 minutes, an average speed of over 15 knots per hour; the maximum speed recorded for one hour was 15·6 knots. We may add that the contract speed of the ship was 15 knots. The performance of the vessel throughout the trial was satisfactory in all respects. The owners were represented by Mr. Ringrose, Mr. W. H. Brodrick, M. I. Mech. E., and Capt. Pearse, ; the builders by Capt. Murrell, and the engine works by Mr. M. S. Gibb and Mr. J. B. Williams. The steamer will take up her station on the line in a few days, and we have every expectation that, with her sister ships, the Hull and Netherlands Company will find these vessels admirably fitted for this service.

Grovehill.—On July 23rd, the new steel screw steamer *Grovehill* (of which we gave particulars in our July issue, page 490), built by Irvine's Shipbuilding and Dry Docks Co., Ltd., for the Rederiaktu "Groveland" of Landikrona, proceeded to sea on her trial trip. The ship and engines gave every satisfaction to the owners' representative, a mean speed of 10 knots being attained on the trial runs.

PARAGRAPHS.

SCHOLARSHIP.—We have considerable pleasure in noting that a scholarship of the value of £50 per annum has been founded in connection with the Institute of Marine Engineers, through the kind instrumentality of Jas. Dixon, Esq., chairman of Lloyd's Registry of Shipping. The scholarship is to be called "Lloyd's Registry Scholarship," tenable for two years. A second scholarship is to be founded after the lapse of a year from the first one being gained, so that an examination will be held each year. The arrangements in connection with the examination will be made by the Council of the Institute. The object of the scholarship is set forth in the regulations drawn up by a committee of, and approved by, the Council of the Institute. Further particulars may be obtained by those who are eligible for examination on application to the Institute of Marine Engineers, which should be made by intending candidates not later than August 18th.

THE MINING EXHIBITION, opened by Lord Strathcona at the Olympia on July 11th, has proved to be most interesting and educational. To the young technical student the exhibition has been of value, in that he has seen demonstrations and heard descriptive lectures, with realistic reproductions before him of the surroundings of the mining of metals, and of some of the dangers to which miners are exposed. Not only to students of purely technical colleges, but to the advanced school boy and girl such exhibitions are valuable from an educational point of view, and we commend the promoters of the mining exhibition as worthy of praise and patronage in their work, they deserve success in their efforts. In the annexe of the building a pavilion was erected, composed of iron fretwork from the Russian iron works at Kyshtim in Siberia; great taste was displayed in this erection, and the eye of the visitor dwelt upon it with pleasure, while the exhibits displayed for sale were examples of what can be done by the moulder with fine grained cast iron—artistic articles and models, some of which are of graceful proportions and in good taste. The history of these ironworks dates back to 1747, and is of considerable interest. There were many exhibits of engineering and mining details in the building interesting to other than the mining engineer and expert. Among these were several on the stalls of manufacturers more or less well known to marine engineers. Messrs. Hopkinson showed a good assortment of their specialities, and a full description of them with sectional diagrams and models. Our attention was called to their Ferranti patent stop valve, as an improvement over the ordinary type, being more compact, lighter and more readily overhauled. The boiler mountings manufactured by this firm are well known. Messrs. Dick, Kerr & Co., along with a large assortment of dynamos and electrical appliances, had on view a complete $2\frac{1}{2}$-ton capstan with the motor connections encased in a well-protected cast-iron cover, the wires and fittings being specially designed to resist moisture; a winch by Messrs. Davies, coupled to a motor for electric drive, was also exhibited, but suited more for land than ship work. Messrs. Cochran and Co., Annan, had diagrams and models of their well-known boilers, showing their excellent method of flanging furnace and fire tubes. The Stirling Boiler Co. had an interesting exhibit of models showing the circulation through the water tubes. Messrs. Sugden's superheater and appliances in connection therewith were worthy of attention. Messrs. Cradock had a capital exhibition of their manufactures in ropes of all sorts and sizes, and special clips and fittings for attachment to suit the various purposes to which the wire rope is now applied. Messrs. Bullivant's exhibits were not less interesting and representative of the class of goods which has made the firm's name well known over the world. Messrs. Mavor & Coulson, Messrs. Scott & Mountain, Messrs. J. Cameron, Messrs. Siebe, Gorman & Co., among the firms dealing with marine work, each had excellent samples of their work and manufactures, and Messrs. Stewarts & Lloyds, Ltd., Birmingham, had examples of wrought-iron and steel tubes and connections used in modern practice.

The Marine Engineer
And Naval Architect.
LONDON, SEPTEMBER 1, 1908.

H.M.S. INDOMITABLE.

THE greatest interest in the performance of *H.M.S. Indomitable* on her return voyage from Canada with the Prince of Wales has been created all over the world, particularly among nations whose existence and security depend wholly or partly upon the possession of a fleet of efficient warships, and we feel that the heartiest congratulations are due to Sir Philip Watts and Engineer-Vice-Admiral H. I. Oram and their respective staffs at the Admiralty on the production of this remarkable vessel, as well as to Engineer-Commander Ayres on the management of her machinery. It may be said with every feeling of certainty that not only is the maintenance of a speed of 24·8 knots from Belle Isle to Land's End, and of 25·13 knots for nearly three days on the high seas a most significant performance, but one which will have a marked and far-reaching influence upon the design and equipment of war vessels in the immediate future. The old order of things, based on the theory that it was impossible to combine in one ship great power of offensive and defensive qualities and at the same time allocate sufficient weight and space for machinery of such power as would give a speed equal to the fastest ocean steamer afloat, will now pass away, and naval architecture will develop along the new lines indicated by the *Indomitable*. One recognises most thoroughly that a warship is at the best a compromise of three essential features, *viz.*: great attacking power, adequate means of protection, and high speed with a practical radius of action, which latter depends upon the fuel-carrying capacity. Having now demonstrated by practical illustration that a cruiser carrying eight 12-in. guns, capable of firing on either broadside, and about twenty 4-in. guns, disposed to resist torpedo attack, can be propelled at an average speed of over 25 knots, it follows that not only we, but other nations, will find it incumbent to have ships of the new type, although at an increased cost, in order to replace many ships built at recent date, but which will have now been rendered more or less obsolete by the production of this new type. The high officers of the British Navy are never content unless they get the best that can be produced, and we feel sure the Admiralty will, as far as the funds voted by Parliament allow, press on with the policy of providing the best for the defence of this great Empire, and those of the British public who take the reasonable and practical view that money properly spent on the navy is in the nature of an insurance premium against war and for the maintenance of the integrity of the Empire, will not grudge the money so expended. The new ship, which is one of three cruisers laid down, has cost nearly two millions of money, and is 560 feet long on the water line, 78½ feet beam, and has a displacement of 17,250 tons. She is propelled by Parsons turbines supplied by steam from Babcock boilers, and the horse power developed is 41,000. The capacity of her bunker is 3,000 tons of coal, in addition to which oil fuel is carried. The official information of the details of the recent trip is practically nil, and having regard to the interest evoked, regret must be felt that the authorities have not seen their way to publish some facts on the subject, and it is not altogether improbable that when the British public get information it may come through the medium of some foreign country, as has happened in the past. However, on the general facts known it is clear that the radius of action of steaming at full speed is about 2,500 miles. It is thought that when leaving Canada the *Indomitable* had 3,000 tons of coal on board in addition to oil fuel, of the quantity of which latter no information appears to be available, but in view of the fact that the coal capacity for her load draught of 26 ft. is 1,000 tons, it is clear that the performance across the Atlantic at much greater draught than 26 ft. is all the more remarkable, and assuming the engineers were developing their full power, the steam consumption must have been in the region of 14 lbs. per horse power hour. This result, together with the satisfactory running of the engines, which we will assume, is good *prima facie* evidence of the value of the turbine engine for this class of ship. It will be a matter of general interest as to the future performance of this ship, and as to the comparative performances of the two ships of this type in course of construction with the above. Everyone will, we feel sure, appreciate the interest and personal activity shown by the Prince of Wales in this record trip, and none more so than the crew with whom he was pleased to become an active unit in getting the best work out of the vessel.

NAVAL PERSONNEL.

AS all the world knows, some few years since a radical change was made in the entry and training of the *personnel* of the Navy. The change affected both officers and men, both those serving and those who were to succeed them. The reasons for the change were obvious: hemp and canvas has given way to steam and steel, and no unprejudiced person who has known the Navy as it was and knows it as it is will deny that the change has been otherwise than necessary or beneficial. The officers have now a common entry and training, and a training to fit themselves for their new environment. The under officers have a real naval upbringing, and the men know how to handle a spanner or a lathe at least as well as their predecessors knew how to handle a marlingspike or a palm needle.

In the process of change, however, some interests have suffered; it was to be expected, as much as it is to be deplored. The question is naturally and properly asked, therefore, "Cannot the grievances thus created be remedied without loss to naval efficiency?" Mr. Gerard Fiennes and Mr. G. N. Barnes, M.P., have in the *Pall Mall Gazette* and the *Daily News* respectively put the case for the complainants, and although these gentlemen approach the matter from very different standpoints, they practically arrive at the same conclusion. Under the old system naval engineering, as a career, was open to the sons of poor men, that is to say, men who were capable of paying somewhere between £40 and £50 per year to the Admiralty while their sons were being trained, as well as some additional sum for outfit and extras. To-day, under the Osborne scheme, the cost to the parents of a boy in the training colleges is some £30 or £40 per annum more. As a consequence, the way is barred to the poorer class, and to all, indeed, whose parents cannot afford to pay at least £125 per year per boy. The other point concerns the engine-room artificers and mechanicians—the latter a new grade of artisan to be selected from the 30,000 stokers in the Service and trained to understand "driving" the engines. Here it is the engine-room artificers who, as they have hitherto been regarded as engine-room watch-keepers, feel that they are aggrieved by the change. The advantages claimed for the new system are two-fold, first, that it opens up a prospect of advancement to the stoker element, creating a cadre of responsible watch-keepers; second, that thereby the artificers will be at liberty to carry out the many repairs which hitherto have had to wait until the ship is in dockyard hands, this latter procedure involving at once a loss of time and greater cost.

So far as the latter grievance, that of the artificers, is concerned, it is generally admitted that the engine-room artificer on entry has a good deal to learn about his engine-room watch-keeping duties. Unless, therefore, he is drawn from a class naturally possessed of greater intelligence and mechanical capability than the stoker, there cannot be much to choose between selected units in either case. The matter, however, is one in which the solution will probably be found after time and further experience have proved the working of the new system. As regards the other point, its settlement is in the hands of the nation. It is clear that it is not only the small class that has been shut out by the higher fees that should be given an opportunity of reaching the quarter deck, but any lad who has the brains and ability to reach this position in the public service. There is but one way of doing this, and that is to make education in the Naval Colleges absolutely free.

THE UNITED STATES METALLIC PACKING CO., LTD., have changed the address of their London office from 17, Victoria Street, to 110, Fenchurch Street, E.C., telephone 2010, telegrams "Zircons."

THE SCOTTISH NATIONAL EXHIBITION.—Our visit to the Scottish National Exhibition at Edinburgh formed a very pleasant interlude amid the restful change associated with the time dedicated to a respite from the cares of office and State. We were prepared by others, who had gone before and given an unfavourable report of the land, to expect little of interest to compensate for our journey, but were agreeably disappointed. Certainly after a few visits to the Franco-British and the sights there, the Edinburgh Exhibition seems small almost to insignificance, but there are features in connection with the latter which render it quite as interesting and valuable educationally, probably more so if only a day can be spared by the visitor, the vastness of the former militating somewhat against its value to such. The machinery section contains a bakery and confectionery in operation, with stalls dealing out results to whoever will buy, and these can be recommended. The worker in glass is also in evidence, and the printer with his press at work, samples of type, the Linotype machine, with specimens of work; printer's inks and results of printing in various colours. Among these we noted a case of medals awarded in former years to A. B. Fleming & Co., for the excellence of their inks. The firm is well known to marine engineers for their lubricating oils, especially hydro-carbon solidified oil. Brown Bros. are represented and known by the Telemotor and the other special work which has been recently illustrated and described in our pages. Several handsome models of warships are exhibited by John Brown & Co., Clydebank, and Watson, Laidlaw & Co. have on view their well-known engineering specialities. A compact suction gas engine of 90 B.H.P., by the National Gas Engine Co., is shown at work. The Midland Railway Co. has a capital stand, with illustrations of the various places of note on their route. The models of dredgers and other vessels on the stalls of Lobnitz & Co., who along with Simons & Co. have made Renfrew known the world over for their dredging plant, are worthy of note and record. The Stirling Boiler Co. show a sample boiler, diagrams and table giving results from practice and showing high efficiency. A neat concentric capstan—Liddle's patent—with head of two different diameters for change of speed, driven electrically or otherwise, as required, compact and suitable for ships' use, the gear well protected, is shown by Mitchell, Graham & Son, who also exhibit tools and serviceable machinery of neat finish. John Macdonald & Co. is another firm whose tools and exhibits claim attention, with special reference to the "Crown" pneumatic hammer, for which high efficiency and low cost of up-keep are claimed along with other advantages. The other portions of the Exhibition are full of general interest and the arrangements of the caterers quite equal to the requirements of visitors, a matter which not only adds to their comfort, but saves time. Lovers of pictures and of heirlooms will find pleasure and satisfaction in visiting the Art Gallery and the Celtic sections. The paintings are representative of the works of Scottish artists, chronologically arranged and form a fine collection; while the many rare and valuable historical memorials gathered, or lent by the heads of old Highland families, abound in interesting reminiscences. The model of the *Lusitania*, lent by the Cunard Co. and shown alongside that of the *Britannia*, the first steamer of the line started in 1840, affords food for contemplation. The Carron Co., whose history dates far back, was in its early days associated with ordnance, and now is famed for grates, ranges and similar appliances, of which excellent samples are on view. The manufacture of aluminium articles and the many specimens made of this metal are of more than passing interest. In the grand hall, with its great organ and accommodation for 2000 people, concerts have been given and conferences held. On August 5th, presided over by Sir Kenneth Mackenzie, a particularly important meeting in connection with the Royal Scottish Arboricultural Society was held, when Sir Herbert Maxwell delivered a lecture on "The forces and resources of the United Kingdom," in which he pointed out the great and increasing demand for wood, both in the United Kingdom and elsewhere, the amount imported and the necessity of a systematic replenishment of trees in this country to keep up and increase the stock. The duty of the present generation is surely to husband and replenish for those who are to follow, and we wish the Society all success in their endeavour.

PARSONS MARINE MOTOR.

WE have pleasure in illustrating on pages 34 and 35 a large Marine Petroleum Motor just completed by the Parsons Motor Company, of the Town Quay, Southampton.

The motor is rated at 100 B.H.P., and has four cylinders, each 9" diameter by 12" stroke, and when developing its full power runs at 400 revolutions per minute.

The motor has been built to the order of C. Wilson, Esq., of Hull, for his auxiliary yacht *Orelia.* Many novel features are embodied in the design, as will be seen by reference to the illustrations, which show a thoroughly marine job, and not a car engine in any sense. In the first place the normal revolutions are only 400 per minute, thus contributing materially to propeller efficiency. The cylinders have ample area to develop the power at this low speed, and are of massive design.

As stated above, the engine is designed to run on petroleum, *i.e.*, paraffin, and any of the ordinary lamp oils may be used of S.G. about 820, and having a flash point up to 100°F.

One of the chief features of the motor will be seen by reference to the illustration, Fig. 1, showing a section through the cylinders and valves, which shows the patented combination arrangement of the inlet and exhaust valve.

The exhaust valve is seated on the hollow tubular inlet valve, as shown.

The exhaust gases at high temperature pass through the latter valve on their way to the exhaust pipe, and thus raise its temperature, so that the incoming sprayed charge is vaporized, but only the moment before it enters the cylinder. The vaporization is perfect, and this fact contributes materially to the success of the Parsons Engine.

As is well known, if the charge be not heated sufficiently, a considerable portion is deposited as moisture on the cylinder walls; and, on the other hand, if the charge be superheated, tar is deposited on valves and piston, which eventually clogs these, causing them to set fast. Both these serious defects are entirely eliminated by the patented arrangement of the valves. The valves are mechanically operated by separate cams, but no extra work is put on the cams and rollers, as the large valve only lifts on the suction stroke, carrying with it the exhaust valve which remains seated on it, and on the exhaust stroke the inner valve only lifts. The arrangement of the valves permits of the engine being run on petrol, paraffin, or alcohol, which is a special feature of the motor.

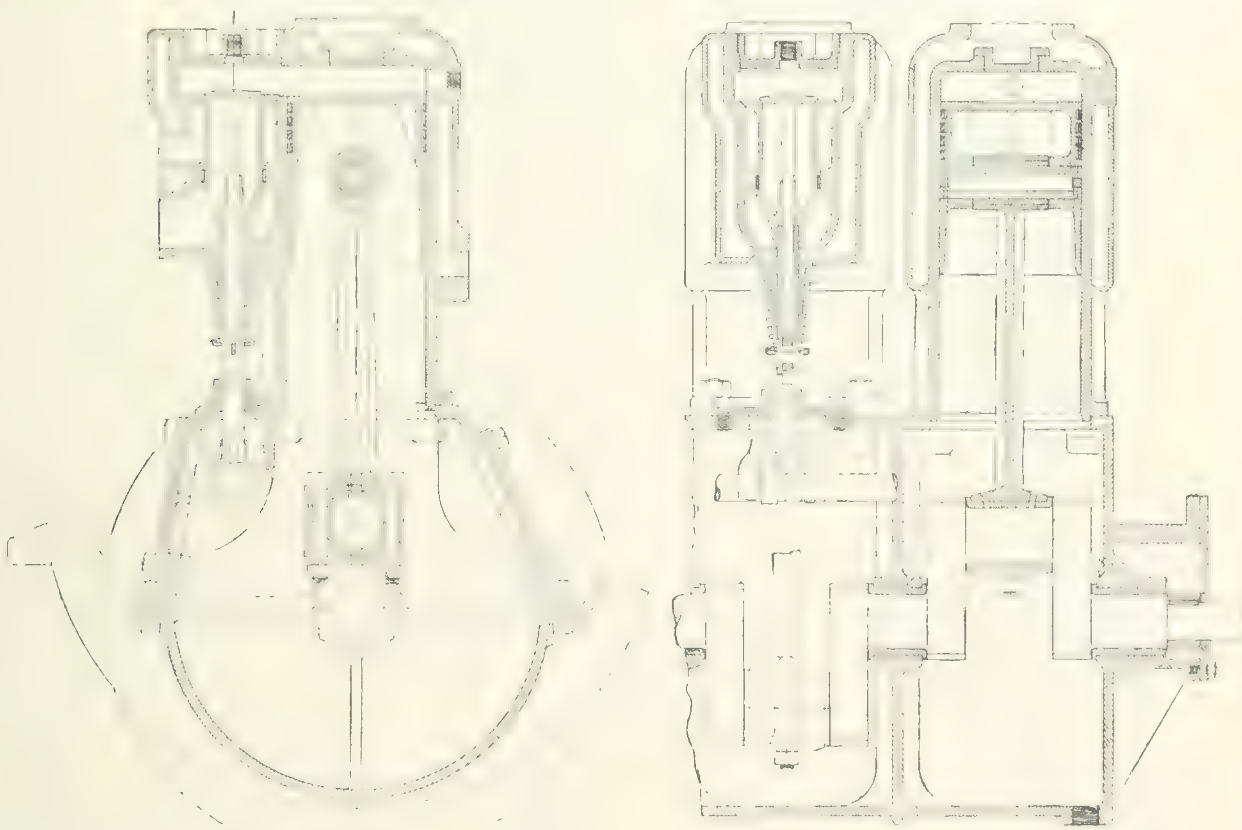


Fig. 1.—The Parsons Marine Motor. Section through cylinders and valves, showing patented combination arrangement of inlet and exhaust valve.

If the engine is to be run on paraffin it is first started on petrol, which can be filled into the carburetter, or, better still, by turning a cock handle which is fitted to the carburetter, and which has a pipe connection to a small petrol supply tank.

In some special cases the use of petrol for this purpose is inadmissible, and to meet these the Longuemare-Parsons carburetter is fitted, which, though not a paraffin carburetter, is designed, together with special connections on the motor, so that readily be cleaned out. The illustration, Fig. 2, shows the water service connections to jackets, and valve caps, and the water cooled exhaust pipe, also the cam shaft and a connecting rod bottom end.

The circulating water is supplied by a specially designed pump driven by skew gearing, Fig. 2. The pump is of gun metal throughout, and is constructed with a drum, having two vanes, and has an efficient grease lubricating system, so that there is nothing that can stick and break the driving gear. The pump

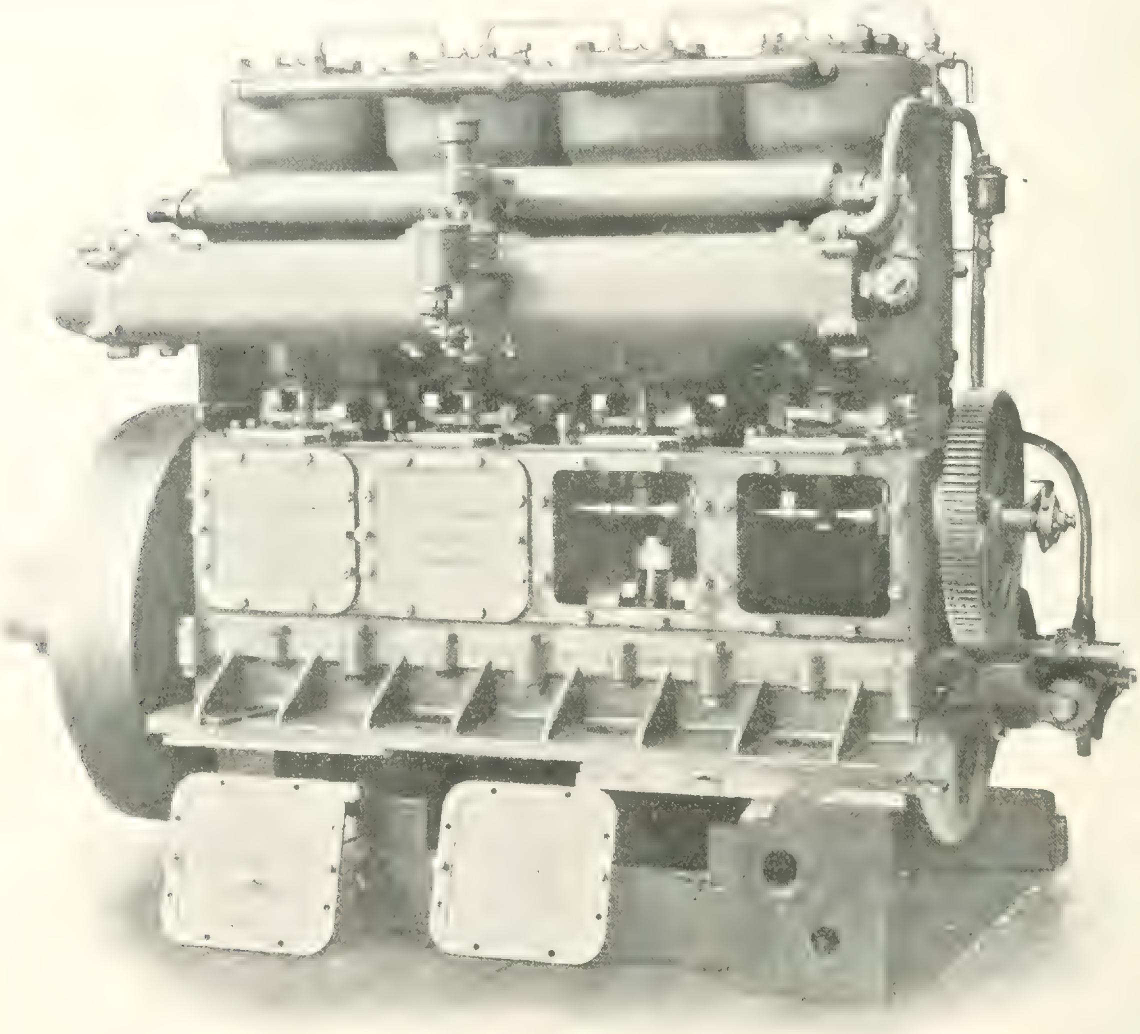


Fig. 2.—100 h.p. 4-cyl. Marine Motor, valve side.

a blow lamp may be applied to "start up," and the engine started and run on paraffin.

Ignition is by battery and coil usually, but, if desired, a low-tension dynamo, driven by the motor, and arranged to keep the battery charged, can be installed, or the high-tension or low-tension magneto with magnetic sparking plugs. In the motor under notice it is by battery and coil for ease of starting and for all-round reliability.

As will be seen by Fig. 1, ample water jackets are arranged round cylinders and valves, which can can be run in either direction, and owing to its construction can deal with solid matter to some extent, and will not rust and set fast.

The firm's practice is to fit the engine vertically with a universal joint, which allows a raking propeller shaft. This arrangement of vertical engine ensures proper lubrication of the crank pins, etc. The universal joint is very strongly constructed and the bearings for the pins are bushed with phosphor bronze. A clamping ring in halves is bolted round the pins, thus giving a very rigid joint. A special feature of

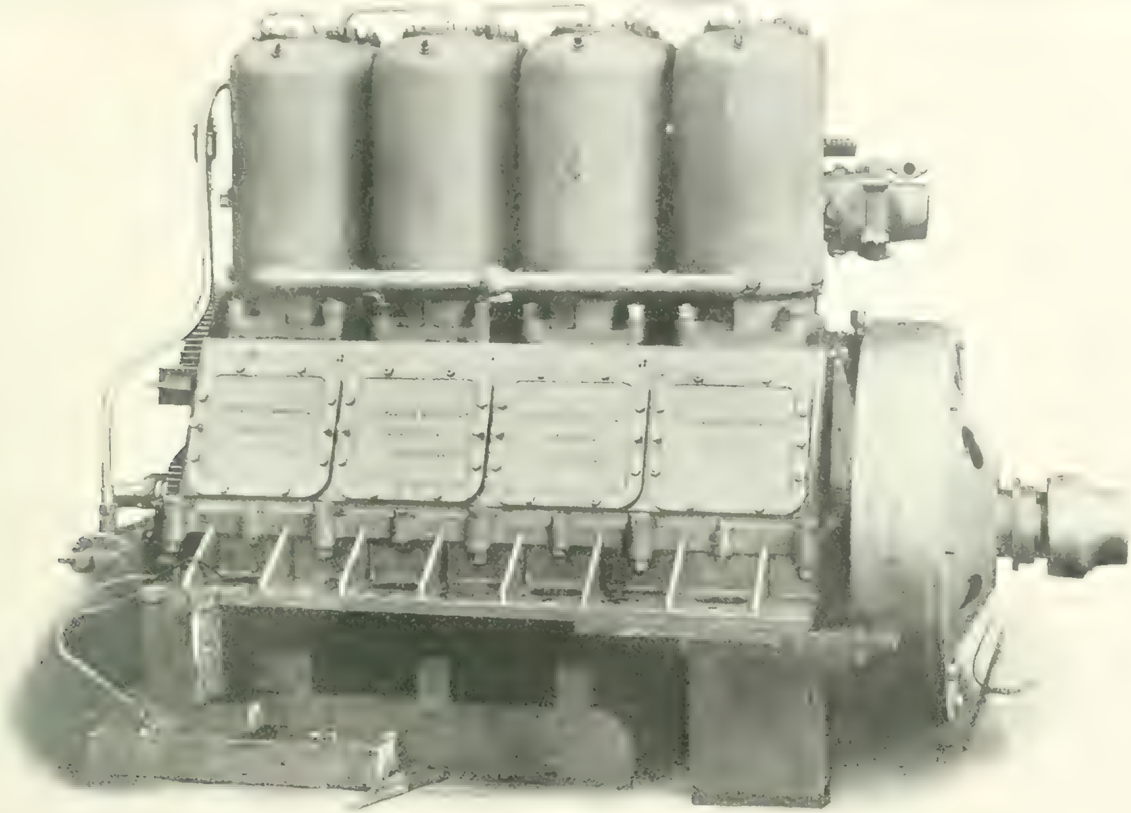


Fig. 3.—100 H.P. 4-cylinder Parsons Marine Motor Reverse side.

the joint is that it is only necessary to take out the bolts in order to disconnect the shafts, when either shaft can be lifted vertically, without any endwise motion, as the end of one half of the joint passes through the jaw of the other half, thus avoiding the necessity of moving either engine or gear-box, etc.

The motor has been carefully designed to give easy access to the various bearings, etc., and has large inspection doors, both at front and back of the entablature as shown, Figs. 2 and 3. The doors have starting screws, and by removing the doors the crank pins and main bearings are fully exposed for examination.

The soleplate is strongly ribbed and has a sufficient number of holding-down bolt holes to ensure rigidity. It is jointed to the entablature casting horizontally at the centre line of the crank shaft.

The Parsons patent "metal to metal" cone clutch is fitted on the extension of the crank shaft as shown, Fig. 4; it is of very simple construction, and has no internal complications to give trouble.

Its special features are that it is oil containing, has gradual engagement and an entire absence of end thrust, whether in engagement or not. The operating forks can be placed anywhere round the circle, thus facilitating easy fitting in any position found in practice.

The clutch is constructed as follows: There are two forks which are attached to the operating lever, which is pivoted between the points of attachment of the

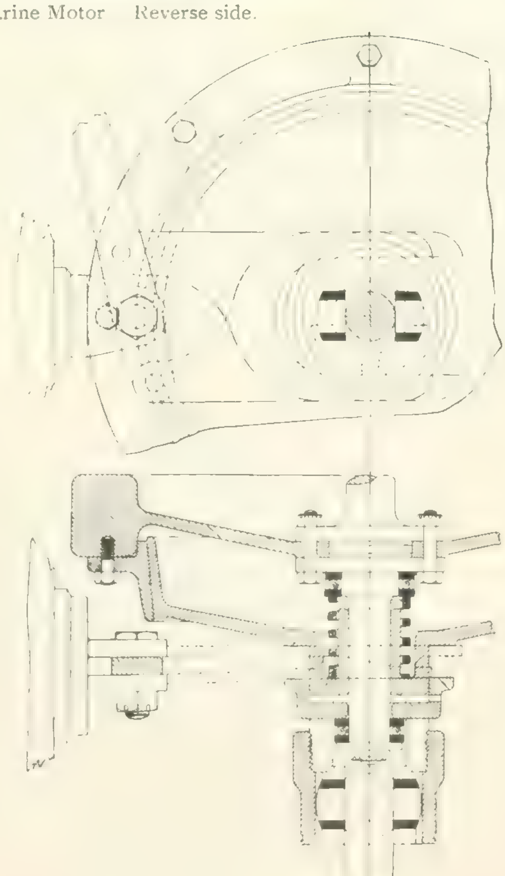


Fig. 4.—The Parsons Patent (metal to metal) Cone Clutch.

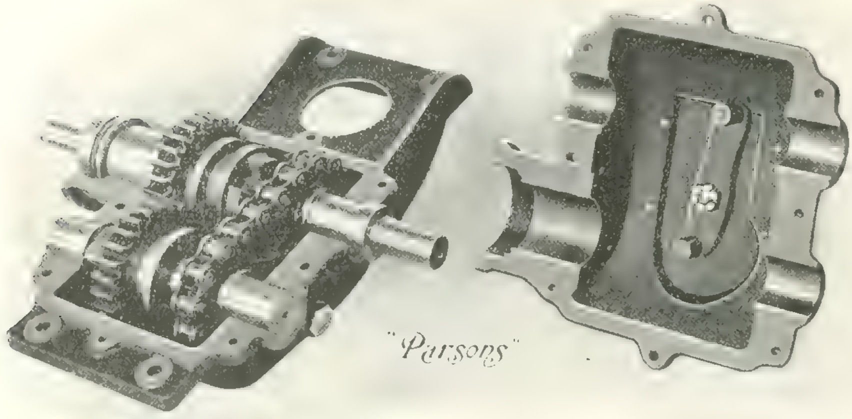


Fig. 5.—The Parsons Reverse Gear. (Ahead).

forks. The fork ends have inclined planes at their extremities which, on the lever being moved one way, slide along each other and force the ends apart against the action of an internal spring, thus disengaging the clutch. The re-action of the spring is taken upon a collar which transmits the pressure upon a ball thrust bearing at the end of the extension shaft. A second ball thrust bearing takes the pressure of the spring internally. When engaged the forks lie idly in the groove, and do not touch either the collar or the clutch.

The Parsons Reverse Gear, Figs. 5 and 6, is particularly simple and strong, and does not contain any friction clutches, pinions, or epicyclic trains of gearing, which are a constant source of trouble and anxiety.

It consists of two shafts, one of which is stationary on the ahead drive, the drive being direct. The astern drive is through a heavy roller chain on to the lay shaft, and thence by a pair of massive spur wheels to the thrust shaft. A ball thrust is combined with the gear, which is very small for the power transmitted, thus economizing space. There is, of course, a neutral position, and on withdrawing the engine clutch the ahead or astern gear can be immediately engaged.

Parsons motors are made in the following sizes:

No. of cylinders.	Cylinder diameter.	Stroke	Revolutions.	I.H.P.
One......	4½"	6"	680	7
Two......	4½"	6"	680	14
Three ...	4½"	6"	680	21
Four.....	4½"	6"	680	28
Three ...	6½"	8"	550	45
Four.....	6½"	8"	550	60
Three ...	9"	12"	450	75
Four.....	9"	12"	400	100

This brief description of the Parsons motors will suffice to show that they are a thoroughly marine job, and they have proved their reliability wherever fitted.

In the reliability trials in 1905 the firm was the only one whose motor gained full marks for fuel economy in its class, the motor being of 14 B.H.P.

The firm's premises adjoin the Town Quay, on the Southampton Water, and are opposite the yacht anchorage. There is an excellent boat jetty with shears for lifting boats bodily into, and out of, the water. At the entrance to the works there is an extensive motor garage with every convenience. The works are electrically driven throughout.

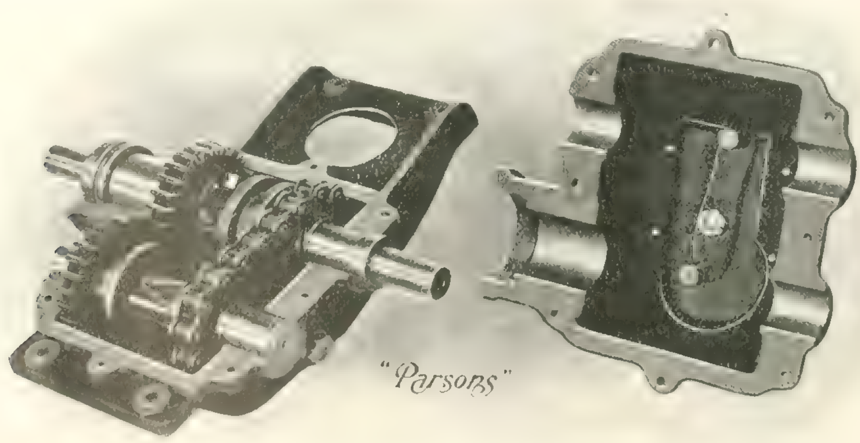


Fig. 6.—The Parsons Reverse Gear. (Astern).

THE FLEETS OF THE MAIL LINES.

(*From our Own Correspondent.*)

A Combination of Reciprocating and Turbine Engines.

THE launch of the *Otaki*—an 8,000-ton vessel now completing at Dumbarton by Messrs. Denny and Co. for the New Zealand Shipping Company—marks a very interesting development in the science of marine engineering. I think it was last year that, in referring to the quality of the turbine which enables it to use steam almost down to its ultimate expansion, Mr. Parsons remarked that much economy would result in practice from a combined installation of turbines and reciprocating engines. Following this observation came an announcement from Belfast to the effect that one of the two 14,000-ton steamships which Messrs. Harland & Wolff now have under construction for the passenger service to the St. Lawrence of the Dominion line, would be fitted with such a combined installation, and in point of fact I believe that in this very month of September, the vessel referred to (which will be appropriately named the *Laurentic*) will be put into the water. But meanwhile the same idea had taken shape in another direction and the New Zealand Shipping Company had placed an order for an 8000-ton cargo steamer with such a combination of engines with the firm of Messrs. Denny and Co., of Dumbarton. So on the 15th August the *Otaki* slipped into the waters of the Clyde and thus once again Scottish shipbuilders got ahead even of the keen Belfast people.

The *Otaki* has three propellers on three shafts. The two sets of reciprocating engines drive the wing shafts, whilst a Parsons turbine is fitted to work the centre propeller, the steam going first to the two sets of reciprocating engines. The fact that she had such an installation would, of course, make the *Otaki* a notable ship in any event. But perhaps the fact that she is designed for a speed which will not exceed thirteen knots at sea will make her even more worthy of attention, for I do not think the turbine has as yet been applied to any vessel of a speed of less than seventeen knots, and it has, of course, been considered that, as at present applied, the principle of the turbine was unsuited for slower ships. Should the *Otaki*, therefore, prove the success which it is anticipated she will be, there can be little doubt that the type she represents will be largely copied.

The Cunard Company

has been a good deal in the public eye during the last few days, for on Wednesday, the 12th August, the agent of the company left New York for a holiday in England, travelling by the *Mauretania*. No sooner was he safely started on his travels than a report of an interview with him was circulated in the New York press, and it was alleged that he had stated that, commencing in March, 1909, the Cunard Company would divert its mail steamers from Queenstown, sending them after that date from Liverpool still, but with calls at Plymouth and Cherbourg instead of at the Irish port. There seemed to be an inherent improbability in the suggestion that after once going to the South of the Lizard a vessel would turn round again and go up the St. George's Channel to Liverpool. So Fishguard put in its claim and said that it was said that it was indeed the fact that Queenstown was to be left on one side. But the Cunarders were not really going to either Plymouth or Cherbourg. They would drop mails and passengers at Fishguard on their way to their old port of destination. Thus far had the discussion got when the *Mauretania* reached Queenstown, and Mr. Brown, the Cunard agent, got a chance to explain that he had never said what was attributed to him, that, indeed, he had never been interviewed either on the subject suggested, or at all. Nevertheless it still seems to be in the mind of many people that the Cunard Company does contemplate a move, and that it will eventually call at a Continental port to tap the main stream of traffic.

The same company was indirectly involved in a libel suit which occupied the attention of the Liverpool Court of Passage earlier in the month of August. The plaintiff in the action was formerly a bath-room steward aboard one of the larger passenger steamships of the Cunard Company. Some time ago he was discharged from the service because a passenger complained that he had been unduly pressing in his hints in respect of a tip. It was said that whilst this passenger was talking to his friends, the steward interrupted the conversation and made demand for the customary largesse. Be that as it may, the complaint was made and the steward discharged. In process of time a "private and confidential" circular was sent out by the superintendent steward of the Cunard Company, in which a list was given for the benefit of other superintending stewards, of the names of men whose names had recently been entered in the Cunard "black book." With these men's names were also given the offences which had led to their having such entries made against them. In the circular appeared the plaintiff's name and with the name a remark that he had committed the offence of "soliciting fees." The inclusion of his name in this confidential circular constituted the alleged libel of which the man complained. After hearing the evidence the Court came to the conclusion that the communication made was a privileged one, it being the custom amongst the passenger lines to afford confidential information of this kind to one another, and it being fairly obvious that the practice is one which, if properly carried out, is to the good of the travelling public. But the incident shows the immense care with which the foremost passenger lines carry on the details of their business, and how they take every means in their power to get the best possible class of employés for the responsible duties which service in these floating hotels entail.

Compensation for Accidents.

Now that the Workmen's Compensation Acts have been in their operation extended to the case of seamen—in which term, of course, are included not only those who take watches on deck, but also engineers and stewards—the decisions in these cases become of great interest to the majority of my readers, and I propose in future to notice such cases as seem to be of importance to them.

Towards the end of July there was a curious case before the judge of the County Court of Liverpool. The claimant was the widow of a man who had been employed in loading grain aboard a steamer at the Nelson Dock in that city, and he had died of typhoid fever. The claim for compensation was based on the allegation that the disease from which he died was "an accident" within the meaning of the Acts. It is probably common knowledge that certain diseases incidental to certain occupations are scheduled as what is called "industrial diseases," and that injury from them amounts to accident. Amongst such diseases may be cited anthrax, to which workers in raw wool are peculiarly liable. and lead poisoning, which often affects another class of workers. Further the law says that, though a disease may not be so included in the schedule, that fact is not to be taken to prejudice the claim of a workman if the disease be a "personal injury" within the meaning of the Act. Now in the case to which I refer the widow alleged that the illness of which her husband died was induced by a foul stench which he told her arose from the grain in which he was working. There seems to be no doubt that this grain was not sound, having been damaged by fire and water, and therefore there was some likelihood that it would not be altogether sweet. In the event, however, the decision of the County Court judge was against the claim. I venture to think that there is likely to be a good deal of litigation in regard to this point till some authoritative decision is given by the House of Lords in the matter, for in another case the Court of Appeal ruled against the claim raised in respect of a disease because it held that that illness was contracted in the course of the man's ordinary employment, and that thus it must be taken that, in accepting the engagement to do his work, he had undertaken to run the risk of catching an illness. It would seem to the ordinary man that the reasoning here relied on would shut out claims in respect of anthrax and such like illnesses and thus render the Statute nugatory in this regard. However, this is not the place for a technical legal discussion, and I will merely state my conviction that the wise man will not rely on what he can get for himself, or those dependent upon him, from the chances of the Courts, but, in spite of the existence of the statutes, will continue to provide for his family, as far as he can, through one or other of the numerous thrift

[illegible] which have [illegible] good for the employed of all classes in the past.

Another Legal Matter

of great interest to those who sail the seas has been raised in connection with the facts disclosed at the Board of Trade inquiry into the circumstances attending the loss of the steamship *Albion*. This steamship was wrecked off the coast of Spain near Cape Finisterre at 6 p.m. on the 2nd May, 1908, when on a voyage from Bahia Blanca and St. Vincent to Rotterdam, with a large cargo of wheat. She struck a shoal in fine clear weather and became a total loss. None of the ship's papers seem to have been saved—even the scrap log which got as far towards safety as being put into a boat was not forthcoming. The officers of the ship attributed the stranding to the jamming of the steering gear, which they alleged to have always been sluggish, and the Court adopted this evidence in this regard and found that the cause of the wreck was the jamming of the steering gear when the master was manœuvring the vessel in a dangerous part of a narrow channel. No blame attached to officers, crew or managing owners. So far the matter was one of a very ordinary kind. But it was the subject of the insurances which had been effected on the vessel which drew special attention to the case. The *Albion* seems to have been fully insured by her owners—and this they were certainly entitled to do. Indeed, they were only acting as prudent business men in covering their risk. But there were outside insurances, other than re-insurances, effected upon and in connection with the ship at the time of her loss, by persons having no insurable interest in the ship, cargo or freight, to the extent of £12,600 in amounts varying from £100 to £3400. The Court took occasion, therefore, to express its strong disapprobation of P.P.I. insurances by persons who have no insurable interest in the vessel insured. It even went so far as to call for a legislative enactment to prohibit the making of them on two grounds. First, that they tended to raise the rate of premium against legitimate insurers, and second, that their existence tends to throw unjust suspicion on owners, captain and officers from the fact that the ship is thus over-insured. Some of the policies referred to were certainly by persons who had no insurable interest, one insurer admitting that he took out policies for upwards of £3000 on the ship in a name not his on. His only connection with her or her cargo seems to have been that he was clerk to a company which supplied her with paint. Such a P.P.I. policy may be indefensible. But too sweeping an enactment against honour policies might strike at those who really had insurable interests though not altogether of a usual kind, and might thus do individuals extreme injustice. Hasty and ill-considered legislation, though a craze of the present day, is an evil of worse effects than many things which are supposed to be remedied by it. It would be regrettable indeed if marine insurance were to be placed on the lines of, say, fire insurance, where, though the companies take the premiums, there seems to be no obligation on them to indemnify the sufferers beyond such contributions as they may themselves think reasonable, their contracts being framed with great art so as to cut down the rights of the assured to very nearly vanishing point. Since the *Albion* case attention has again been drawn to the subject in connection with the loss of the steamship *O*[illegible].

The Kron Prinzessin Cecile,

the latest of the Nord-Deutscher Lloyd express steamers, seems to have achieved a wonderful performance at the close of July. She crossed to the westward from Cherbourg in five days, fifteen hours and twenty-three minutes, the average speed of the run being 23·21 knots. This average is ·21 knot better than her own previous best, and ·06 knot better than the fastest run of the Hamburg-American liner *Deutschland*, so that the Nord-Deutscher Lloyd would appear to have captured the record for all German ships.

The Allan Line,

having added so much first-class tonnage to its fleet of late, has been able to dispose of a couple of its older vessels to the ship-breaker. The vessels in question are the *Corean* of 3488 tons, built at Sunderland by Messrs. Willliam Doxford and Co. in the year 1881, and the *Sarmatian*, of some ten years greater age, built at Greenock by Messrs. Steele & Co. She was in her day—which was rather a long one—a very favourite steamer, as she had the honour of taking H.R.H. the then Marchioness of Lorne across the Atlantic on more than one occasion when the Marquis was Governor-General of Canada, Of late the old ship has, I think, been lying up in the Gairloch, and her last active engagement was sailing from the Thames.

The Hamburg-American Line

has issued a description of the new steamship *Cincinnati*, which is under construction for them at the yard of Messrs. F. Schichau at Dantzig. She is described as being of the improved "P." class. That is to say, that in general idea she is and in employment she will follow the well-known *Pennsylvania* and *Patricia* and their sisters. But she will much surpass these vessels in size, her gross register being 16,400 tons. Her length is about 590 ft. with 65 ft. beam. Thus she will be about 3000 tons greater, 30 ft. longer and nearly 3 ft. wider than the *Pennsylvania*. She has accommodation for 218 passengers in the first class, 336 in the second and 2700 in the steerage. Of the saloon passengers some seventy can have single-berth cabins, whilst a similar number have rooms with but two berths. The second-cabin passengers also have a large number of two-berth rooms. These points seem nowadays of great importance, for privacy at sea is much appreciated by passengers, who are apt to expect the same kind of accommodation—in every respect—in the big liner which they would find in first-class hotels. With her 360 crew the *Cincinnati* will have a population, when full, of upwards of 3500 persons.

The "Indomitable" and the New Cunarders.

Warships must have other qualities than speed, and it is not, therefore, quite fair to take the claim made on behalf of H.M.S. *Indomitable* too seriously. She made a wonderful passage indeed on her eastward run with the Prince of Wales, and beat everything—but the new Cunarders. From the last Canadian land to the Fastnet she is said to have steamed 1684 nautical miles in two days nineteen hours. This gives a speed over that course of 25·13 knots. The best passage as yet made by the big Cunarders was that of the *Lusitania* at 25·01 knots over a course of 2891 nautical miles. So far it would appear that the warship had the advantage. But since this performance by the *Indomitable*, the *Lusitania* has done still better. Leaving Queenstown on the 16th August, she broke the record for a day's steaming by achieving to noon on the 17th no less than 650 miles, her speed being 25·61 knots. The subsequent runs were 631, 623, 610 and 246 miles to Sandy Hook, making, with 21 miles run before noon on the 16th, a total of 2781 miles, which was accomplished at an average speed of 25·23 knots, or ·10 knots better than that of the *Indomitable*. The *Lusitania* also reduced the time of crossing to four days fifteen hours, which is some three hours and forty minutes better than the previous record. I think, however, that she has not even yet shown all she can do. But it must be remembered that the *Lusitania* is timed for this performance over a course very nearly twice the length of the *Indomitable*. We know how much that means in practice from the experience of the great Atlantic liners which were sent to the Cape with troops in the time of the South African war. Vessels which could do their nineteen knots with ease over the 3000 miles of the New York voyage fell off, say, three knots, when running the 6000 miles to the Cape. A fairer comparison therefore, would be to take the performance of the *Mauretania*, which is recorded to have maintained a speed of 26 knots for 1200 miles and no less than 27·30 knots for a spurt of 300 miles.

A New Departure.

The Cunard Company has succeeded in finding a new method of catering for the comfort and pleasure of travellers by its steamships. It has entered into an arrangement with the Daimler Motor Company, whereby it becomes possible for east-bound passengers to order seats in motor cars—or, I suppose, to charter entire cars, if they please, for their private use—by wireless telegraph whilst their vessel is even yet at sea. The cars provided will either take their occupants to London, showing them something of the beauty and antiquity of English scenery *en route*, or will take them for special long-distance excursions as they may desire. The idea seems a good one—though I doubt whether the London

and North-Western Railway will entirely approve of this diversion of traffic.

The Railway Agreement.

Speaking of the premier railway company reminds me of the agreement into which it has entered with the Midland for more harmonious and economical working. What the effect on railway matters may be is not a thing to discuss in this column. But it must not be forgotten that there is keen competition between the Fleetwood route of the North-Western and Lancashire and Yorkshire Railways and the new Heysham route of the Midland Railway for the Belfast and North of Ireland traffic. Indeed, as a reply to the vessels which the Midland has provided of late, the Fleetwood route has just ordered two new ships, said to be of the turbine type. It is quite on the cards that an arrangement which will largely affect the competitive sailings on these two routes will soon be announced by the now friendly managers.

OBITUARY.

Joseph Beardmore.—The death took place on August 7th, at Moreton Lodge, Eye, Herefordshire, of Mr. Joseph Beardmore, of Parkhead, and a director of William Beardmore and Co , Ltd., Parkhead Forge and Steel Works and Dalmuir Shipyard. Deceased, who was only in his 41st year, had been in ill health for some time, and on that account had been relieved from all active share in the large industrial works at Parkhead and Dalmuir. While far less prominently identified with the affairs of the Parkhead, Dalmuir and allied concerns than his brother, Mr. William Beardmore, the deceased up till about two years ago had charge of the forge departments at Parkhead. He had a thorough practical knowledge of the work carried on, and was greatly esteemed by the large staff of workmen employed. Parkhead and Mossend are among the largest steel undertakings of Great Britain, and are equipped in a splendid manner. Upwards of 5000 men are normally employed, though in common with kindred undertakings Beardmore's has had its share of the prevailing depression. This applies at the moment more particularly to the large shipbuilding and engineering works at Dalmuir, specially laid out for undertaking the heaviest naval work. As indicating the capacity, in ordinarily busy times, of the steel works at Parkhead and Mossend with which the deceased was associated during his short span of life, and over which and other allied undertakings his brother still ably presides, the following figures may be given :—318,000 tons of ingots per annum ; 150,000 tons of plates, 15,000 tons of forgings, 10,000 of castings, 25,000 tons of tyres and axles, and 8000 tons of armour—a total output of 526,000 tons a year. The consumption of fuel per annum amounts to 490,000 tons, and as much as 87,840,000 cubic feet is produced daily when the works are in full swing, providing 8550 engine horse-power. The works as a whole at Parkhead and Mossend form perhaps the largest of their kind in the world, the plant and processes employed being of the most up-to-date kind. The enterprise of Mr. William Beardmore has extended in many directions, and much sympathy will be felt for him in the loss by illness and death of a valuable coadjutor in Mr. Joseph Beardmore.

THE CITY (LATE LEASK'S) ACADEMY, 4 and 5, High Street, Aldgate, London, E.C., again record a success at the July Extra Examination, namely, two out of the three London passes. This speaks for itself for the efficiency of this Academy in the other grade of examination, namely, chief and second engineer. As Mr. Battle, the proprietor, says, "My students are always my best testimonials."

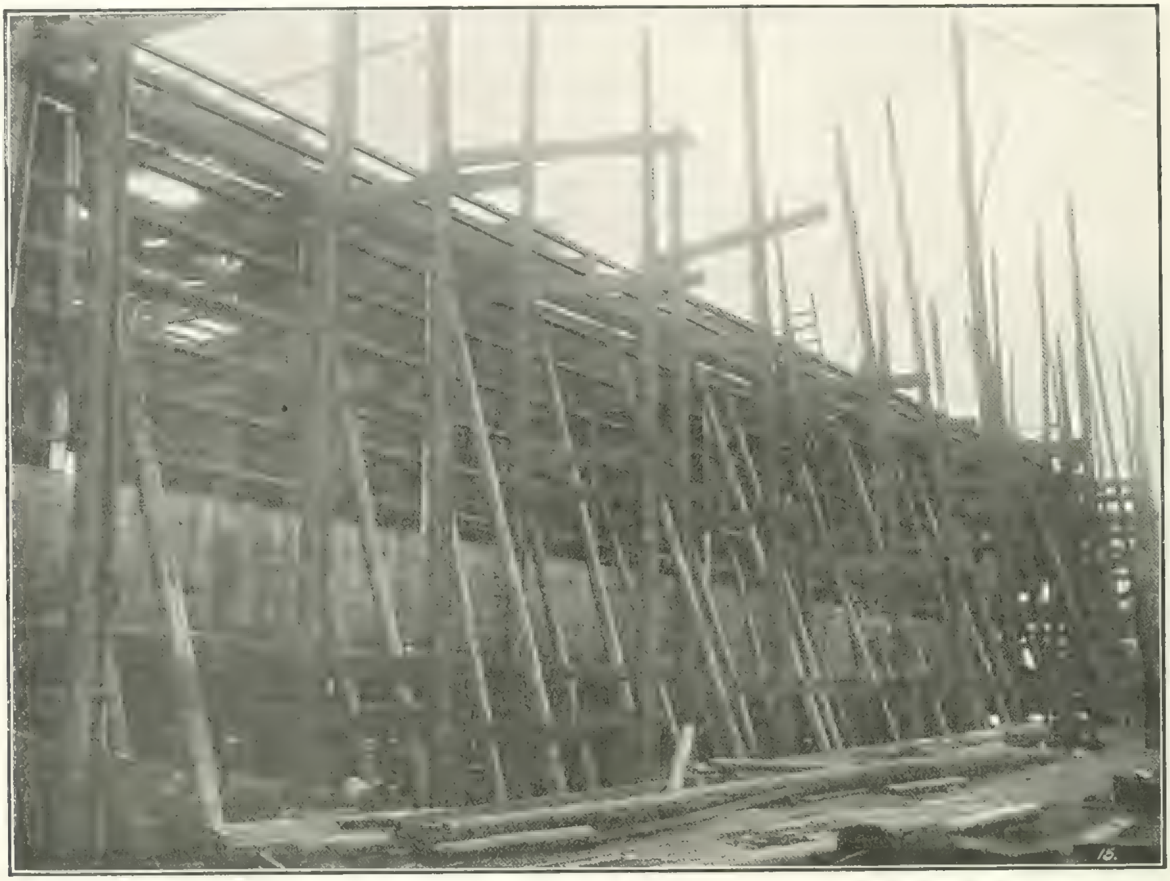
TORPEDO FACTORY AND TESTING RANGE.—The arrangements appear now to be completed for the erection of a torpedo factory on the Clyde at Greenock, with testing range on the waters of Loch Long. The contractor is starting the works and the current for lighting and power is to be supplied by the Corporation under arrangement with the Admiralty. It is pleasing to know, referring to Loch Long, that the so-called statement made in foolishness of speech as to the damage being done by visitors to Ardgoil during the holiday season on being investigated had no foundation in fact.

THE "PAUL PAIX."

MESSRS. R. Craggs & Sons, Ltd., launched on August 12th from their Tees Dockyard, Middlesbrough, the steel oil tank steamer *Paul Paix*, built for Messrs. Lennard's Carrying Co., Ltd., of which Mr. J. Milner Lennard is chairman. The occasion was one of considerable importance, as this is the first ship to be built on the Isherwood system of construction. The dimensions of the vessel, of which we give a view, are 367 ft. overall, 49 ft. 6 in. beam extreme, and 28 ft. depth moulded, and it is sub-divided in order to form sixteen separate oil tanks. The steamer is designed to carry 6400 tons deadweight, and special arrangements are made to enable her to load right down to the full load draught with a cargo of motor spirit with the same facility as with the denser oils. In the Isherwood system of construction the closely-spaced transverse ribs, with which we are familiar in ordinary vessels, are omitted and the transverse strength is obtained by fitting on the shell and deck plating a series of strong transverses at widely-spaced intervals. These transverses extend completely round the sides, bottom and deck of the ship, and are slotted to allow of longitudinal frames and beams being fitted continuously through the transverses. The new system, of which we give two views, enables the steamer to be built of greater strength than ordinarily, and at the same time the deadweight-carrying capacity is considerably increased. The construction is simplified and all parts are readily accessible, thus reducing maintenance repairs to a minimum, and offering greater facility for damage repairs. In addition to the vessel being constructed on the new system, the general design, for which Mr. E. Hall Craggs is responsible, differs in some respects from the ordinary single-deck type, having a continuous expansion trunkway above the oil tanks ; quadruple-expansion engines are to be fitted amidships, and arrangements have been made for three main boilers to be fitted abreast. The coaling arrangements are very simple, and very little trimming is necessary, the cross bunker forward of the boiler-room being the main permanent bunker. The bridge space is to be utilized for reserve bunkers. A double bottom available for carrying oil fuel or water ballast is fitted in the machinery spaces. The vessel has been built for the highest classification of three classification societies—*viz.*, Lloyd's, British Corporation and Bureau Veritas, and the whole process of tank testing under pressure on the stocks has been carried out with remarkable facility, and to the entire satisfaction of all concerned. There are two complete cargo-pumping installations of unusual power designed to deliver the fuel cargo into shore tanks in the course of a few hours. Accommodation for the ship's company is very commodious and complete in every respect. All details have been arranged in consultation with Mr. William Lennard, of Middlesbrough, whose long experience in manipulating the bulk oil trade has been of great value, and the inspection of hull and machinery has been carried out on behalf of the owners by Mr. J. Smaling and Mr. J. Marshall respectively. Considerable interest was evinced in this new system, and there was a large attendance of commercial men at the ceremony, which was performed by Mrs. J. Milner Lennard.

MR. TOM WALKER, late of Messrs. James Walker & Co., Poplar, London, informs us that he has associated himself with Messrs. Ronald, Trist & Co., of Lloyd's Avenue, London, E.C., managers in this country for the Quaker City Rubber Co.

THORN'S SCHOOL OF MARINE ENGINEERING.—At the recent examination for extra first-class engineer, the following candidates were successful :—At North Shields, Messrs. H. Valentine, of North Shields, A. F. Menzies, of Glasgow, and C. C. Nelson, of Isle of Man. At Glasgow, Messrs. E. F. MacClafferty, of Carstairs Junction, N.B., J. Reid, of Portsoy, N.B., and J. Houston, of Glasgow. At Leith, Mr. J. Johnston, of Leith, and at West Hartlepool, Mr. J. Harris, of West Hartlepool. Out of the above five were prepared by the system of postal tuition originated by Mr. W. H. Thorn, and of these four passed the first time, as did also two more of the above pupils. They were all prepared by Messrs. W. H. Thorn & Son, 5, Waterville Terrace, North Shields, from whose establishment there have now passed 177 extra chiefs, 30 surveyors and over 6900 2nds and chiefs.



Side view, showing frame work in position.

Bow view, showing frame work in position.

The Tank Steamer, "Paul Paix," built by Messrs. R. Craggs & Sons, Ltd., Middlesbrough.

against. Engines have so much improved since submarines were first built, continued the right honourable gentleman, that such an escape as white mice would serve to register is no longer to be feared. There appears, therefore, to be no remedy for such an accident at present, but luckily they are very rare. A test mobilization of the port defences was carried out from August 3rd to 15th, during which the boom defence of the Hamoaze was tested, the sloops *Reindeer* and *Mariner* being moored in the entrance to the harbour. During the last two days, an examination service was observed, two special service vessels and a flotilla of torpedo boats being engaged in a tactical scheme, which included the boarding of all ships entering the Sound by one division of boats, while the other division protected the shipping. While entering the defences under Fort Bovisand, Torpedo-boat No. 86 struck on the rocks, but happily the only damage done was to her propeller shafting and steering gear. She was towed off by the special service vessel *Traveller* and brought in for repairs.

Sheerness Dockyard.

The vessels of the Home Fleet returned from the manœuvres at the end of July and after a month's stay left again for a cruise on the East Coast of Scotland, from which they are due to return about the middle of September. The Fifth Cruiser Squadron came back after an absence of three months, but the vessels only stayed to give leave before proceeding on another cruise. A slight mishap occurred when the destroyer flotilla was returning from the exercises. As the vessels were steaming past the dockyard the *Seal* and a fishing boat, which was crossing the harbour, collided. The boat was cut down to the water's edge and her two occupants thrown into the water. They were, however, rescued by a boat lowered from the *Seal*, whose commanding officer made every effort to avert the accident. A steam pinnace towed the fishing boat to the pier, where she was beached. With the return of the torpedo craft additional work came to hand, four of the boats having been placed in the steam basin to be refitted. The destroyer *Sprightly*, which had been in the basin for three months, has been reboilered, and has rejoined the flotilla at Chatham. The *Teazer*, one of the boats built ten years ago, is in hand, and the *Wizard* will shortly follow. The gunboat *Thrush*, which only completed her refit here in July, soon returned, having damaged her stem at Grimsby. She was taken into the steam basin on August 14th, but as some of the damage was below the water line she had to be dry docked. Submarine "C5," which was recently damaged in Yarmouth Harbour, is again doing duty with the Nore Submarine Flotilla. She was escorted to Harwich by torpedo boat No. 10, and her place in No. 1 dock, which is now reserved for submarines, has been taken by "C6." The old battleship *Camperdown*, which has been lying in the Medway for some time, is to be towed round to Harwich to act as a berthing ship for the submarines, instead of the battleship *Rodney*, which was at first selected for the service. The delay in the delivery of the battleship *Lord Nelson*, which was to have relieved the *Bulwark* last spring, has led to the selection of the *Magnificent* as the temporary flagship of the rear-admiral of the Home Fleet. The *Bulwark* has gone to Chatham to refit preparatory to joining the Channel Fleet. The new cruiser *Indomitable* attracted a great deal of attention on her arrival on the morning of August 9th. There was quite a large array of vessels here on the following day, which was Coronation Day, and the noise of the firing of the salutes in honour of the occasion could have been heard far out to sea. On August 7th we had a distinguished visitor, the Italian Ambassador, who made a tour of the establishment, accompanied by Captain Johnston Stewart, the captain-superintendent, and Flag-Commander Margesson, of the Nore staff. On the 15th we had another visitor, Mr. Marshall, C.B., the Director of Dockyards, coming down to have a consultation with the captain-superintendent and the heads of departments. Rear-Admiral Startin, who was recently captain-superintendent at this yard, is to be congratulated upon his first appointment as a flag officer, having been selected for the post of rear-admiral in the Channel Fleet. The Admiral, who was promoted in February of last year, remained here some little time after his advancement to flag rank. Quite a number of changes are being made among the engineer-officers here. Engineer-Captain Edwards, who had been on the staff of the Commander-in-Chief at the Nore for over three years, has been succeeded by Engineer-Captain Hurst, and has gone on the staff of the rear-admiral commanding the Nore Division of the Home Fleet; while Engineer-Captain Agnew, who had filled that position since May, 1906, has joined the *Dreadnought* for special service. Engineer-Commander Pedrick, late of the *Royal Sovereign* at Devonport, has joined the cruiser *Shannon* for service on the staff of Rear-Admiral Callaghan, having been relieved in the *Royal Sovereign* by Engineer-Commander Hughes. It is a rare thing nowadays for an engineer-captain to get a rest between his appointments. Indeed, it is a moot question whether it is not time to slightly increase the establishment of such officers.

Chatham Dockyard.

With the exception of the damage sustained by the destroyer *Ranger* in collision with the *Haughty* in a fog, there was no accident to any of our vessels during the manœuvres, and even the *Ranger*, as I stated last month, was put right in time to resume her place in the destroyer flotilla. This is very satisfactory, and shows the Home Fleet to be in a most efficient state, both as regards *personnel* and material. The battleship *Trafalgar*, which is used as a tender to the School of Gunnery, met with a slight mishap when being undocked and had to be redocked for the damage to be made good. The cruiser *Charybdis*, before leaving Sheerness for Colombo with a new crew for the *Astraea*, came up here after the manœuvres, defects having developed in her water service. The repairs, however, were soon effected and she proceeded on her voyage on August 4th. Very good progress is being made with the conversion of the cruisers *Apollo* and *Andromache* into mine-layers. Some extensive alterations are being carried out, including the laying of rails along the decks for the conveyance of mines to the stern of the vessels, where they are dropped overboard. The vessels, when completed, will be attached respectively to Devonport and Chatham. The battleship *Formidable* was paid off on August 17th from the Channel Fleet in readiness to be taken in hand for an extensive refit, the vessel not having had a complete overhaul since she was completed at Portsmouth seven years ago. The work to be carried out will cost upwards of £60,000, more than half of which will be for labour. Should the efforts to salve the cruiser *Gladiator* be successful, it is practically certain that her repairs will be carried out here. Originally, it was arranged that an extensive refit of the vessel should be commenced at this yard during the financial year and £24,000 was allocated for the purpose, but if the ship is considered worth repairing, a much larger sum will be needed. Some use is evidently to be made of the old battleships *Rodney* and *Edinburgh*, as orders have been given for them to be dry docked. No extensive repairs are, however, to be made. There is to be no delay in carrying out the work of dredging the Medway, and two hopper barges are to be lent from Portsmouth to expedite the work. It is hoped that the dredging will be continued up to the entrances to the locks, so as to deepen the main channel through several of the reaches of the river. The *Bacchante*, the flagship of Vice-Admiral Sir Henry Barry, of the Third Cruiser Squadron, is to return here about the middle of October to change admirals, the new chief of the squadron being Rear-Admiral Sir Henry Jackson, the present Controller of the Navy. It is not expected that the vessel will remain here more than a fortnight. It is interesting to note that the whole of the service of the *Bacchante*, with the exception of a few months in the Reserve Divisions here and at Portsmouth, has been in the Mediterranean as flagship of the Cruiser Squadron, having successively flown the flag of the late Rear-Admiral Sir Baldwin Wake Walker and of Rear-Admirals the Hon. Hedworth Lambton and Sir Henry Barry. She was first commissioned here in November, 1902, so before she has been in commission six years she will have been flagship of four admirals, which, I should think, is almost unique. The first of our submarines, "C 17," was launched on August 13th, Mrs. Giffard, the wife of the admiral-superintendent, performing the naming ceremony. As already stated in these columns, the vessel has been built under conditions of strict seerecy, and this caused most ridiculous rumours to be set afloat, it being stated in some of the London papers that the launch was to take place at midnight. It, however, took place at noon. No visitors were present, the only spectators

being Vice-Admiral Giffard and the principal officers of the yard with their wives and families, who gave a hearty cheer as the vessel touched the waters of the Medway. She was afterwards towed to No. 2 Dock to be completed for sea. The vessel is 130 feet long, 13 feet 6 inches wide, and has a displacement of 313 tons when submerged. The engines, which have also been built here, are of 600 i.h.p., which will give a speed on the surface of thirteen knots.

Pembroke Dockyard.

Just recently a deputation of Welsh members of Parliament proceeded to the Admiralty to urge the desirability of allocating one of the five new cruisers to Pembroke. The deputation called attention to the fact that past experience proved that large vessels can be built as economically here as elsewhere, and therefore the Admiralty would be well advised if they placed an order for one of the new ships with us. Mr. McKenna said he would have been very glad to have acceded to the request, but the policy of the Admiralty "made it impossible for ships of the character indicated to be built on the western coast. The absence of a graving dock in particular made the task of building such a cruiser at Pembroke impossible." He, however, assured the deputation that there would be no further reduction at the yard, and that it would be more fully utilized for the kind of work that has been carried out here. The Admiralty could, however, have got over the difficulty by ordering the existing dry dock to be made suitable for the new type of cruiser, which will displace about 5000 tons. The dock was large enough for the old battleship *Collingwood*, which displaced 9150 tons, but to accommodate the class of vessel about to be built it would require lengthening, and it is estimated that this could be done for about £20,000. The construction of the *Bellona* is being pushed on with all expedition, the aim of the authorities being, it is thought, to absorb the full amount of the grant for labour during the financial year. The number of hands employed on the vessel has recently been supplemented by the men who have been working on the "camels" for Dover Harbour. At the end of July we had a visit from Dr. Macnamara, the Secretary to the Admiralty, and Rear-Admiral Sir Henry Jackson, the Controller of the Navy, who were accompanied by Mr. Marshall, the Director of Dockyards. Their lordships received deputations and afterwards inspected the *Boadicea* and *Defence*, while Dr. Macnamara visited the Hut Encampment, where he lived as a boy with his father, who was a sergeant in the 47th Foot, now the Loyal North Lancashire Regiment. With regard to the *Boadicea* she was towed from Hobbs Point Pier to the Carr Jetty at the beginning of August, but she will only remain there until the *Defence* returns. She will then be placed in dock to be prepared for her steam trials, which will probably take place in November, instead of October, as at first proposed. The *Defence* left on August 5th for a three hours' preliminary steam trial. Upon returning she underwent successful anchor trials, and afterwards proceeded to Devonport to be docked preparatory to the official steam and gunnery trials. She returns here about September 13th. The refit of the destroyer *Greyhound* is being satisfactorily proceeded with, and it is expected that the vessel will be undocked at the beginning of September. A rumour is going round that the Admiralty have under consideration the desirability of reverting to the practice of building in the yard the boats required for the ships under construction here, instead of ordering them from private contractors. The revival of the practice would be very popular.

Messrs. Russell & Co., Port Glasgow, are reported to have booked an order from Messrs. John Black & Co., shipowners, for a steamer of about 7000 tons deadweight capacity, which will be especially fitted up for the South American trade.

A Retrospect.—Since the day when Glasgow's oldest inhabitant first saw the light, many eventful stages have been chronicled. The advertising of the *Comet* a century ago, to sail with passengers down the Clyde, was the beginning of the now excellently-equipped steamers plying amid the lochs with which the Firth of Clyde is indented, and as the beat of the paddle on regular day service, or the hum of the turbine on occasional evening cruise, is heard from the waters of Loch Long, on the borders of which the centenarian dwells within the boundary of Ardgoil, he has been able to contrast what now is with what has been in respect to the navigation of the waters, from near the time of the *Comet* to the *Lusitania*, from the days of the *Empress* to the *Indomitable*. Such has been our meditation as we gazed upon the chiselled features of Henry Bell. The improvement which has taken place in the Clyde is phenomenal and the history of it forms interesting reading; the river banks show ever-extending lines on both sides, betokening advances in shipping and commerce year by year, while the facilities—not granted because of urgent solicitation by repeated memorials, as the manner of some is, but provided in anticipation for the growth of new communities and the necessary movements of men and material—serve to show the wisdom of an enterprising and far-seeing Corporation. The jubilee of the successful laying of the Atlantic cable being completed recalls the important part taken both in the preliminary work and its accomplishment by the late Lord Kelvin, then Mr., and afterwards Sir, William Thomson, Professor in Glasgow University. The interesting details in connection with the cable, its manufacture, the controversy as to its composition and the system of the current to be passed through, the voyages towards either of the arranged termini, have all been admirably described by those who took part in the proceedings; we have read the romantic account again with pleasure on the fiftieth anniversary of the landing day of the cable ends. When the *Agamemnon*, after paying out 1030 miles, brought to land at Valentia, on the Kerry Coast of Ireland, the British end, almost simultaneously with the landing of the American end by the *Niagara* at Newfoundland, both were speedily secured and attached, then was the message transmitted amid an enthusiasm which was justified in the epoch-making event, "Europe and America united by telegraph, glory to God in the highest, on earth peace and goodwill towards men." This was followed by the congratulatory message from Queen Victoria to the President of the United States, and his response. The advances made with the electric current since August, 1858, have been many and great; the experimentalists and workers are still on the move to accomplish what lies beyond, the angel of futurity beckoning on, encouraging research and invention. The advent of the *Comet* on the face of the waters a century ago and of the Atlantic cable into the depths half a century ago have been marked as historic events, whence have sprung advances in shipping and commerce, with all the prosperity and comforts which have followed in their wake, and now the navigation of the air—the waters above, comes as the problem which appears to be reaching nearer to a solution. The success of Count Zeppelin, qualified, however, by the defect in the mechanism of his airship, which brought him from the region of the waters above into the waters of the Rhine, has shown a result to be reckoned when considering the possibilities of aërial navigation, and the destruction by fire of the airship, the crowning result of the expenditure of much painstaking and ingenious contrivances, evokes our heartiest sympathy with Count Zeppelin, whose distress on witnessing the, meantime, unhappy ending of his labour must have been considerable. That the German Government decided to accord to him the tribute of the vote to cover his loss financially will be to some extent a solace, but beyond that remains the natural disappointment which we hope will be surmounted, and that he may again set himself to design and build, backed by all the experience he has gained, a vessel, buoyant, steerable and fit to cleave the air. We wish him success in his work that he may overcome his present disappointment. We know many who have expended much ingenuity, with time, labour and material, upon the solution of this problem, with results which have left them poorer in pocket and richer only in experience, yet of such are the pioneers—the sowers, by whose instrumentality succeeding generations are enabled to reap, and it is fitting that the reapers should accord to the sowers an acknowledgment of their indebtedness. The trials and successes, also, which have attended the efforts made to construct a vessel to skim over the water illustrate the wide field which is covered by the inventive faculty, and those who have witnessed the results of light skiffs and the speed attained are sanguine of such a vessel proving popular for at least the frequenters of lakes, rivers and coastal estuaries, the motion being pleasant and exhilarating.

SHIP-MODEL EXPERIMENTAL TANKS.

APROPOS of the serious efforts which are now being put forth, under the direction of an influential and energetic committee of members of the Institution of Naval Architects, to have an experimental tank established for general service at the National Physical Laboratory in Bushey Park, London—towards which Mr. A. F. Yarrow's splendid gift (under conditions) of £20,000 must be fresh in mind—it may be of interest, if not helpful as a spur to extra endeavour in this country, to learn something of what other countries have and are actually doing in this direction. The committee referred to consists of nine members, whose career and standing in the profession of naval architects, and in connection with the agencies for education therein form ample guarantee for the efficient carrying out of the scheme. Besides Mr. A. F. Yarrow, the generous donor, this committee includes such well-known authorities as Sir Philip Watts, Sir W. H. White, Dr. Francis Elgar, Mr. W. E. Smith, C.B., of the Admiralty; Dr. Glazebrook, director of the National Physical Laboratory; Mr. R. E. Froude, and Prof. J. H. Biles. Mr. Yarrow, whose generosity has brought a long-talked-of scheme very near materialization has, on the whole very naturally, made some stipulations as to a fund for the upkeep of the tank and its staff being subscribed for by others who are bound to benefit from an establishment of the kind, conducted on the lines generally desiderated. The committee are now considering the best methods of obtaining this fund, and as to how work at the tank is to be controlled so as to be of the greatest practical use to shipbuilders, marine engineers and ship owners. Naturally these subjects involve many points which require a great deal of preliminary discussion, but the constitution of the committee is such that general agreement on all points really essential to the realization of the project, on a basis likely to be permanently satisfactory, may safely be counted on.

According to an interview reported in a New Zealand paper, Colonel John M. Denny, of the well-known Dumbarton shipbuilding firm, who has recently been touring in the Far East and Australaisa, was much impressed while in Japan with the magnitude and character of the shipbuilding works of the Mitsu Bisha Co., Nagasaki. He stated that these works have on hand 100,000 tons gross of shipping orders for private owners. He is also said to have informed the interviewer that his firm have been fitting up for that enterprising company an experimental tank based on plans of the Dumbarton tank. Supplementing this general statement with some general facts, which are not matters of common knowledge, will throw light on the enterprise of our Eastern allies and the material assistance it evokes, and doubtless needs—in this very special branch of experimental science at least—from friends in the home country.

The tank at Nagasaki, we learn on good authority, is now completely built and equipped, and will soon be yielding results. As regards the general construction of the tank and its housing these have been carried out from plans prepared under Messrs. Denny's directions by Mr. J. M. Crawford, architect, Glasgow, who was for many years with the Dumbarton firm and supplied the architectural plans for the tank established a few years ago by Messrs. John Brown & Co., Clydebank. The new tank is practically a duplicate of the latter. It has a waterway of about 445 ft. in length, of which 400 ft. is deep, varying from 9 ft. at one end to 10 ft. at the other. The breadth is uniformly about 20 ft. and in connection with the tank proper there are small wet and dry docks for the storing of models, a drawing office, superintendent's office, the necessary rooms for preserving the records, and a department in which the experimental models, which are of paraffin wax, are moulded and cut by special machinery. The work of excavating and housing the actual tank has been done by Japanese contractors, but apart from this everything has been supplied by Messrs. Kelso and Co., electricians and model makers, Glasgow, whose experience in this special direction is unequalled. Their contract included not only the carriage and recording apparatus, but also the dynamos, the model-cutting machinery, and the rails on each side of the tank, on which the carriage supporting the model and the recording apparatus runs. Like the Clydebank tank, that in Japan has the apparatus worked by electricity, one respect in which, as yet, the Clydebank tank is alone in this country, other tanks having steam as a motive power.

In their essential features all the experimental tanks in this country, and most of them abroad, are based upon the original tank devised by the late Dr. William Froude (brother of the renowned historian), and carried on by him for many years at Torquay under Admiralty countenance and assistance. The Torquay tank eventuated in the larger and more perfectly equipped Admiralty establishment at Haslar now presided over by Mr. R. E. Froude, son of Dr. William Froude. The first to sufficiently appreciate the work of William Froude, and to give practical effect to his appreciation in the way of laying down a similar experimental branch for the use of his firm, was the late William Denny, of Dumbarton. This tank, at the time quite an unique feature in a private shipyard, was started about 1884. On the façade of the tank building, fronting the public street, the late Mr. William Denny, who was an enthusiastic admirer of the work of Froude, caused to be sculptured a medallion portrait of Mr. Froude, underneath which is the following inscription:—"This façade of the Leven Shipyard Experimental Tank is erected in memory of the late William Froude, F.R.S., LL.D., the greatest of experimenters and investigators of hydrodynamics. Born 29th November, 1811. Died 14th May, 1879." Beyond saying that this department in the Leven Shipyard has enabled the firm of William Denny and Bros. to undertake contracts and guarantee results which firms throughout the country fought shy of meddling with, and that conjoined to their general skill as shipbuilders this department and the fruits flowing from it have earned for the firm an almost unequalled reputation as builders of high-speed channel and other steamers it is here needless to enlarge. Sometime prior to Messrs. John Brown & Co. being instructed to proceed with the actual planning and construction of the huge Cunarder *Lusitania*, the experimental tank, which is now a valued branch of the designing forces of their works, was established, but previous to this tanks had been started in connection with Government or University establishments in America and some European countries. Messrs. Kelso & Co. supplied in 1899 to the Royal Italian Arsenal, Spezzia, the dynamometric and current meter apparatus for a tank laid down there, and for a number of years carried on by British experts who had been trained under William Froude. About the same period the Russian naval authorities established a tank at St. Petersburg, for which Kelso & Co. also supplied and installed most of the apparatus. For both the Italian and Russian tanks, however, portions of the equipment—model-shaping machines and sectional paper-ruling machines—were supplied by Mr. Robert W. Munro, F.R.Met.Soc., South Tottenham, London. In 1905 an order was placed with Mr. Munro by the French Ministry of Marine for an entire plant for the tank now established at Paris, which has the distinction of being the largest in Europe. The tank comprised the model-shaping machine, dynamometer, screw propeller apparatus, sectional paper-ruling machine, rolling platform and electrical equipment. In respect of the last two items the Thames Ironworks Shipbuilding and Engineering Co., Ltd., were the supplying sub-contractors.

The tank just established at Nagasaki is similar in all essential respects to the Clydebank tank as regards dimensions, and also like it and some of the tanks in America, it has the towing accomplished by electric power, and there is a truck for recording the resistance of propellers, as well as that for the model of hull. The tank, in short, not only embodies the results of Messrs. Kelso & Co.'s experience as makers, but of a careful study of the tank at Clydebank and Dumbarton, and of a period's actual insight into the operations as carried out in the Dumbarton tank by representatives sent from Japan and trained for a time by courtesy of Messrs. Denny Brothers. A thoroughly trained expert from the Dumbarton tank has engaged for a period to conduct the experiments at Nagasaki, and Mr. Kelso, the principal of his firm, is now on his way home, after having supervised the erection and put the apparatus in working order.

For naval purposes purely the Imperial Japanese Navy is now laying down an experimental tank, and has recently ordered from Mr. Robert W. Munro and the Thames Ironworks Shipbuilding and Engineering Co., Ltd., an entire plant comprising all the items as supplied to the tank at Paris. In this connection it is of interest to state that

Japanese naval officers and students are being permitted to gather information as regards the practical as well as the scientific side of model experiments in the country. Long before it was decided to lay down an Imperial naval tank, indeed long before the ordering of the tank by the Mitsu Bisha Co., of Nagasaki, the advisability of adding a tank to the educational apparatus in the Engineering University at Tokio had been mooted and discussed, and steps actually taken to gather in a fund for the purpose. The hopes of the University, of course, had centred largely on the Government assisting in the establishment of a tank to be associated with the University for educational and general uses. The step recently taken by the naval authorities has naturally rendered the prospect of Government aid for the University tank less hopeful.

Naval architecture for many years has been a prominent branch of study at the Tokio University. The present occupant of the chair of naval architecture is Mr. F. P. Purvis, who was educated at Greenwich Naval College, and one of the late Mr. William Froude's earliest pupils. Mr. Purvis, on Mr. Froude's recommendation, was elected for the position of tank superintendent, and for about ten years was head of the scientific department of Messrs. Denny's yard. After some experience in the practical and commercial sides of shipbuilding as a partner in the firm of Blackwood and Gordon, Port Glasgow, he received his present and more congenial appointment, and an experimental tank has naturally been a coveted "working appliance" for one so trained. The latest information is that a University tank is again very hopefully talked of at Tokio, and the matter is to come before the Imperial Diet in December next.

THE SALVAGE OF SHIPS.

As ships increase in size and intrinsic value by virtue of which they develop the capacity to carry still greater and more valuable cargoes, or armament, every one who has any concern in maritime affairs must be interested in the development of improved means and appliances specially devised and adapted for salving and recovering the vast amount of sea-borne property endangered and rendered liable to total loss by or from collisions, running aground, structural defects or other regrettable casualties only too frequently occurring to ships on or about the coasts of the United Kingdom or throughout the world.

In common with underwriters and shipowners the British taxpayer is beginning to realize that he possesses a common interest and concern in the most perfect methods and systems that can be developed for preserving damaged costly battleships, cruisers and other war vessels, that may be sunk and stranded about our coasts or elsewhere, from becoming a total loss to the country and to the fighting strength of our Navy, whether such damage should occur by accident in times of peace or by design in times of war.

The late disastrous wreck of the battleship *Montagu* on Lundy Island, and the still more recent sinking of the cruiser *Gladiator*, by collision in the Solent, has brought about increased public interest on the score of efficient salvage plant, experienced and capable supervision and of sound reliable working operations such as are necessary in casualties of this kind, to avert a total loss of property and money to the country and the reduction of full strength efficiency to our Navy.

It is now a matter of history that the battleship *Montagu* is a total loss in every respect. The presumption or present opinion is that the *Gladiator* will be salved and restored to continue her duties on the fighting strength of our Navy. Some people argue with a good show of reason that if the salving operations of the *Montagu* had been left wholly and solely in the hands of the Liverpool Salvage Association, she would have been successfully floated off the rocks which pinned her to Lundy Island. It is well known and recognised by underwriters and shipowners that whenever a high-class salvage company undertakes the work of salving any damaged and sunken mercantile ship they do so on their sole authority without any undue interference from the owners or underwriters. This non-interference is invariably rewarded by successful results in all possible cases.

In connection with salvage work very few people trouble to gain a superficial idea of the amount of ingenuity and enterprise which such operations involve. Of course, it is generally known that divers go down to sunken vessels and temporarily repair as well as they possibly can the damage that brought about the disaster. It is also known that caissons or lifting tanks are attached to such wrecks in order to afford certain buoyancy towards enabling the wreck or wrecks to be floated.

However, apart from temporary repairs to the ship and lifting caissons to give buoyancy, it must be remembered that the great and final success of the salving operations rests with the power and efficiency of the pumps employed to empty the caissons and bring their fullest buoyancy into action, and to empty the portion of the damaged hold of the vessel sunk, and to keep under whatever leakage water may have to be contended with.

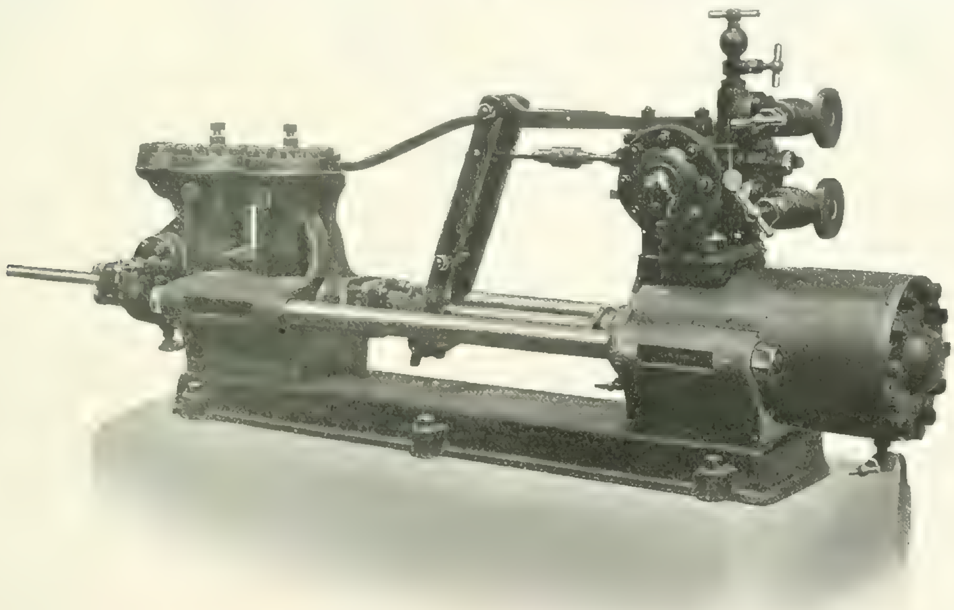
This work calls for very specially-constructed and powerful pumps and plants of perfect and unique design and adaptability. Generally the uses and capabilities of these special pumps are confined to the knowledge of the few most interested parties, and there the matter begins and ends. The engineering problems involved in the science and practice of constructing and applying various kinds and degrees of pumps for numerous purposes and uses is little credited and recognised as being of the highly-important nature and character it should command. Of course, the value of pumps for various purposes is recognised by numbers of engineers, contractors and others, but generally the effect exercised by the best and most perfect pumps on wreck salving operations, on harbour and dock works, on dredging operations, on arid land irrigation, and on a variety of other eminently useful purposes does not receive any attention from the majority of our populace. This laxity of general interest with regard to pumping installations should disappear when their actual value is realized, and it should be replaced by as deep an interest in salving operations as that now displayed with regard to strategic naval bases, dry docks, or floating docks, for the up-keep and repair of the numerous warships of our Navy, both in times of peace and of war.

SAILING SHIP TRAINING.—The *Port Jackson* has again sailed on a voyage to the colonies, her destination being Sydney. This time she has cadets in training, premium-paying apprentices, whose sea-going experience under Captain Maitland ought to be fruitful of good to the youngsters, as well as helpful in maintaining the excellence of the British stock of officers for the mercantile marine.

KYSHTIM IRONWORKS.—Although situated in a territory that we are traditionally inclined to consider with a shudder as cruel and inhospitable, there are parts of Siberia both rich and fertile, and it is in such a region that the Kyshtim Ironworks and estate lie. Situated at the base of the Ural Mountains, near the junction of the Trans-Siberia and the Petersburg-Viatka-Perm Railways, with the river Ufa flowing near on its way to join and swell the waters of the Volga, the position of the works appears an ideal one for means of transit. The discovery of iron in the neighbourhood now embraced by the Kyshtim estates was made about 165 years ago, and in 1747 ironworks were started and gradually developed until, about 100 years ago, a greater impetus was given to the works and surrounding district by the ancestor of the present owners, who acquired the large area covering over 2000 square miles, a tract of country which is not easily realized. At the ironworks the smelting is carried on by means of charcoal, the immense forests on the estate supplying abundant fuel, and the iron produced is of a very fine grain, while the moulding is assisted by the good quality of sand found near, as was witnessed by the excellent specimens of fancy and artistic work shown at the Mining Exhibition at Olympia. Besides iron mining, smelting and casting, there are on the estate gold and silver working from the ore, and the exporting of timber cut down from the almost boundless stock which had hitherto simply been used for smelting and the other purposes of the mines and works. It is stated that 19,000 people are employed on the estate and the arrangements made for their comfort appear to be well up-to-date. It has been hinted that British capital and enterprise are about to be added to the administration of the works and estate; whether that be the case or not the details we have received of Kyshtim are interesting to record, as showing what is going on in Northern Europe in the spread of civilization.

HYDRAULIC PUMP.

WE had an opportunity recently of seeing, at the well-equipped works of Messrs. G. & J. Weir, Cathcart, Glasgow, an adaptation of their familiar pump in use for the hydraulic pressure system which they installed within the last twelve months in connection with their foundry, where there is a light crane on each pillar, for the convenience of the moulders, operated by hydraulic pressure. The success and the saving in time resulting from the installation has been so assured that the firm decided to add to their specialities by making pumps of most approved style, for the purpose of supplying a steady pressure to an accumulator. This they have succeeded in doing and the accompanying illustration shows the style of pump now placed on the market. It is a single steam cylinder, double-acting pump, neat and compact, with the minimum number of working parts, and by the arrangement of steam admission valves the action is absolutely positive—with no hesitation or dead centre. It is designed to be economical in steam consumption, twenty-five per cent. of the stroke being made expansively. The parts are all standardized and in the manufacture the aim is to supply a thoroughly good pump at a moderate price, for works where the hydraulic pressure system can be conveniently operated with success and economy, for cranes, presses, riveting and punching machines and similar class of work.



Hydraulic Pump.

Institute of Marine Engineers.—On Saturday, September 5th, the members of this Institute are visiting the Franco-British Exhibition, where a lecture will be given in the Congress Hall (entrance by staircase to bridge near cascade) at 7 p.m., by Mr. J. T. Milton (member of Council), on the corrosion and decay of metals.

ON HEAT LOSSES.

(I)

THE unavoidable losses in all heat engines are so great, compared with the fraction converted into work, that every care ought to be taken in order to reduce preventable losses to a minimum. Notwithstanding its importance, it has almost been lost sight of for many years—in fact, since superheaters and steam jackets first went out of vogue. The resultant economy in raising pressures from the 80 lb. two stage, to the 125 lb. three stage compound was so great, that, since then, the attention of engineers has been mainly concentrated on the pressure curve, leaving the temperature curve to take care of itself. We have now about reached the point where the economy by any further advance in pressure will be more than swallowed up by increased cost and upkeep, so attention is again being turned in the direction of superheaters and jackets; and with our lessening coal supply and consequent increase in cost of fuel, we may expect that heat will once more take its proper place.

Had the name given by James Watt, *viz.*, fire-engine, been retained, or if the misleading term "steam-engine" had not been bestowed on it, we might by this time have learned to think in Joules instead of pounds per square inch; and it is conceivable that steam would have been of much greater value to us than it is at present.

From the first, owing chiefly to its intractability, steam has had far more attention paid to it than is, strictly speaking, its due, seeing that it is only the agent whereby we convert heat into work. Heat steals quietly and unobtrusively up the funnel and sneaks overboard through the main discharge, attracting little or no attention at any time further than that it is an unnecessary and disagreeable hanger-on of steam; but when one reflects that it is this same despised heat which bursts pipes, blows out joints, and roars out at the waste steam pipe, etc., ideas require re-adjustment to suit.

Considering the many ways in which heat is wasted or allowed to escape while doing work, it is a marvel that it has such a good record. *Per contra*, when used scientifically, it gives such a splendid return, the statement may be advanced that, if the difference in cost between triple and quadruple systems were expended in reducing heat losses in the triple, the resultant economy would prove more than equal to that attained by triple over two stage compounds. Over and above this, Mr. Parsons has demonstrated that by using the semi-liquid, misnamed steam, exhausting from triple engines into his L.P. turbines, a further economy of from 15 to 20

per cent. may be expected; and when we can exhaust dry steam into the turbine, a still higher efficiency may be looked for, and hence the tendency to revert to superheating.

It is, however, an unnatural and desperate remedy, and ought to be resorted to only when other and more legitimate methods are exhausted. In the past, superheaters deteriorated rapidly, and accidents were not unknown even with the pressures then in use.

Steam jackets, on the whole, give much better returns, but when in use, especially with full boiler pressure, there is considerable "scrooping" in the cylinders and torn cylinders are occasionally heard of. On this point, no doubt, some of our brethren in the Navy could speak feelingly; still, jackets do yeoman service when used with judgment, although only touching the outer fringe of the steam, and such service is an earnest of what may be expected when the body of the steam is dealt with.

For many years all competent authorities have pointed out the importance of guarding against heat losses, but until shipowners fully realize how much they would benefit by it, no improvements need be looked for. They specify their requirements, and the trial trip decides whether or no the shipbuilder has fully carried them out. For what happens afterwards the owner alone is responsible.

As soon as the ship goes on regular service, we find that practically every steam and water joint has to be re-made—that half of the boiler lagging finds its way into the bilges, the other half remaining in place only because it cannot get away—and steam pipes in the same, or worse, condition. With auxiliary steam piping so arranged that steam must be on every pipe in the propelling space to supply two or three auxiliaries; with steam often on half the deck pipes in order to supply the steering engine, and glands leaking at the rate of tons per day, to say nothing of the condensation continually going on in steam pipes, is it any wonder that there are such discrepancies between trial trip and service results?

The pity of it is that these and other losses go on day after day in ships all over the world, because the owner or his representative thinks he has justified his existence by the liberal application of a blue pencil to a store indent. Did they but know it, there are other and much better ways of reducing running expenses, whereby pounds could be saved in place of shillings. Unfortunately, in too many instances they know absolutely nothing about the theory of the heat engine, and any suggestions from those who know the cause and understand the reason of things are not looked upon approvingly, but rather the reverse, and therefore they have no opportunity to let the owners know that each pound of steam wasted in leakage or condensation, represents an actual loss to them of from 4 to 5 horse-power. They ought also to know, and to realize the importance of the fact, that "make-up" feed to the amount of five tons per 1000 I.H.P. per day is required, under ordinary circumstances, with a corresponding expenditure of heat either in the evaporator or in raising the water from sea or tank temperature to steam temperature.

Space forbids further remarks on the outward and visible losses, but enough has been said to indicate in a general way the lines on which considerable economy may be effected for little outlay. The cylinder losses are of much greater importance, and will be made the subject of another article in a succeeding issue.

(*To be Continued.*)

Home Defence Force.—Now that the Territorials have been to camp and shown how far the confidence of the country may be reposed in the new system, we may congratulate Mr. Haldane on the result of the first campaign. The camps we have seen or heard reports from show that much has been accomplished in many districts. The county associations have been bestirring themselves and, while a good start has been made, it is necessary that the whole system and intention of the training should be made clear and urged upon the attention of all. The training itself and the discipline under which they are brought are good for young men, and this ought to be pointed out to their parents and guardians that due encouragements may be given to them to join. We note that the palm of first success in attaining to full strength is due to a Liverpool battalion.

ELECTRICITY ON BOARD SHIP.

XIX.*

By Sydney F. Walker, R.N., M.I.E.E., Assoc. M.I.C.E., etc.

Fittings and Accessories for Incandescent Electric Lamps.

In order that the incandescent electric lamp may furnish the light it is designed for, the current must be led from the supply cables to the filament, and in order that the lamp itself may be usefully employed, it requires to be held in the position where light is required by some support. The problem involved is very similar to that of the gas service. It will be remembered that gas is led to the different gas lamps, through pipes, and that arrangements are made at the ends of the pipes to control the use of the gas, and the rate at which it combines with the air, the form in which the flame burns, etc., and also to hold any shade or other protection that is required. The ends of the incandescent electric lamp filament, as described in the last article, are connected to short pieces of platinum wire, which pass through the neck of the globe, for the purpose of connecting the filament to the supply service. In the early days of the electric lamp, the ends of the platinum wires were turned into small loops, and the current was led to the loops by two hooks, through which the current passed, the hooks being held in a small wooden holder and engaging with the loops on the ends of the platinum wires. The writer understands that for board ship work, the loop lamp and the hook lamp holders are still regarded with favour by some engineers, the reason being that the hooks, being formed at the ends of small spirals, allow for a certain amount of vibration, as the ship knocks about, without becoming disconnected from the loops.

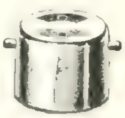


Fig 1 Double Contact D.C.

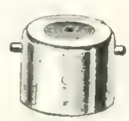


Fig. 2 Centre Contact C.C.

Fig 3 Edison Screw.

Forms of Caps of Incandescent Lamps, as made by the Sunbeam Lamp Co.

The Incandescent Lamp Holder.

The more generally employed incandescent lamp holder, both ashore and afloat, is stronger and better fitted than the arrangement of hooks described above. For use with the lamp holder described below, the incandescent lamps are fitted with caps. The cap consists of a thin brass cylinder, slipped over the neck of the lamp, and held to it by cement of different compositions, plaster of Paris being one of the early substances employed. The ends of the platinum wires are bedded in the cement, or other substances that may be employed, and are connected, in the majority of lamps used, to two small segment-shaped brass plates also bedded in the cement, the two brass plates forming the terminals of the lamp, and the end of the cylinder forming the lamp cap being made flat. This form of lamp cap is known as D.C., or double contact, because there are two contact plates, which, as will be seen, engage with two contacts in the lamp holder. There is another form that is employed on board ship more than anywhere else, known as C.C., or central contact. It has a single brass disc, connected to one of the platinum wires, fixed centrally on the bottom of the lamp cap, the other platinum wire being connected to the brass containing cylinder. The two forms are shown in Figs. 1 and 2. The lamp caps are sometimes made of a specially hard setting insulating substance known as vitrite, and when this substance is employed, the outer brass cylinder is dispensed with in the double contact lamps, the segment-shaped terminal plates being merely bedded on the bottom of the cylinder of compositions. With central contact lamps, however, as it is necessary to have an outer conductor to make contact with the lamp holder, as will be described later on, a brass cylinder is necessary and is employed with central contact lamps, with all forms of composition. The object of employing vitrite and similar substances is to increase the insulation between the platinum wires of the lamp, and to provide a substance that will stand wet, heat and other forces better

* For Articles I. to XVIII., see previous issues.

than the ordinary cements used with the brass containing cylinder will do. So far as the writer is aware, the vitrite lamp caps are not now very much employed, owing to the improvement in the substances employed with the ordinary brass cylinder lamp caps. In all forms of lamp caps, there are two small brass pins projecting from the cap, one at each end of a diameter of the cylinder forming the cap, the pins being placed about one-third of the length of the cap from its base. The object of the pins is to engage with the bayonet joint of the lamp holder. There is another form of lamp cap, known as the Edison screw, shown in Fig. 3. It was introduced by Mr. Edison in the very early days of incandescent electric

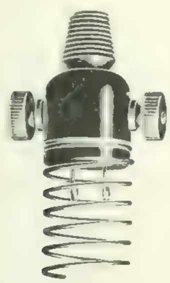


Fig. 4.—Loop Lamp Holder.

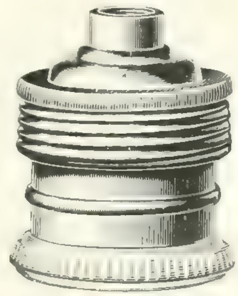


Fig. 5.—Engine Lamp Holder, made by General Electric Co

lighting, and obtained a considerable amount of favour, and is still used to a certain extent. It is a central contact lamp. There is the same central disc on the end of the lamp cap as in the ordinary central contact cap, but in place of the brass cylinder described above there is a very coarse pitched screw of thin metal, and the lamp cap is made to screw into a special lamp holder described below, the screw taking the place of the bayonet joint to be described, and the two pins required with the bayonet joint being dispensed with.

Lamp Holders.

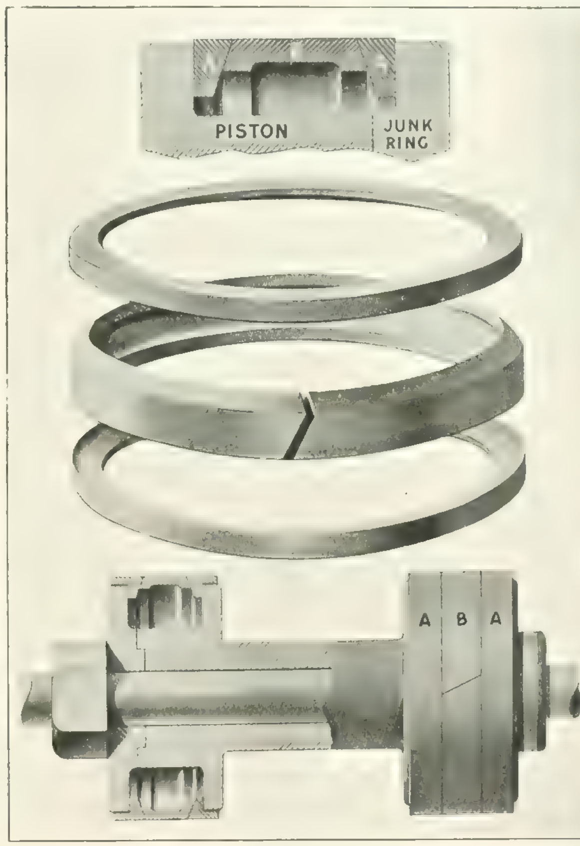
It will perhaps be as well to describe the lamp holders employed with what are called loop lamps, the lamps in which the ends of the platinum wires are turned up into small eyes, at the end of the neck of the lamp, the eyes being intended to engage with hooks on the lamp holder. The earliest form of lamp holder was that designed by Mr., now Sir, Joseph Swan, and is shown in Fig. 4. It consists of a cylinder of wood, with a projecting piece at one end, on which a metal thread screw is cut. At the sides of the cylinder two holes are drilled about one-third into the mass of the wood, and into these holes the shanks of screw terminals are pushed. On the front, or lower, side of the wooden cylinder two holes are drilled, into which two wires are pushed, so as to engage with the shanks of the terminal screws, the outer ends of the two wires being turned up into small hooks. A groove is turned on the end of the cylinder, and in this engages the end of an open spiral spring, designed to hold the neck of the lamp. In practice, the lamp was usually held in a vertical position, bulb downwards, and the wood thread screw on the upper part of the holder, screwed into the end of a bracket provided for it. The neck of the lamp was pushed up into the open spiral spring, and the platinum loops were engaged with the hooks described above, that are in connection with the terminals. The supply wires were brought to the terminal screws, and when the lamp was switched on, current passed from one supply wire to the terminal screw, thence to the hook on that side, thence to the platinum loop engaging with that hook, thence through the lamp filament to the other hook and to the other terminal. A modification of this lamp holder was known as the admiral pattern. The principal difference was that the lamp holder was made of brass tube and arranged to be fixed on the end of a bracket. There were the same hooks as described above, but there were no side terminals, and the spiral holding the lamp was made more open, so that it held a larger portion of the lamp, the width of the successive rings of the spiral increasing as it receded from the holder. The connecting wires were brought through the tube forming the lamp holder to the hooks.

The Edison lamp holder is shown in Fig. 5. It has an insulating collar on its end, and a tubular shaped body, carrying a female screw, on its inside, with which the Edison screw cap engages, and the holder is arranged to be fixed on the end of any bracket, in the same manner as other lamp holders.

WARD'S PATENT EQUILIBRIUM PISTON RINGS.

WE illustrate in the adjoining diagram the construction of equilibrium piston rings manufactured by Messrs. S. A. Ward and Co., of Sheffield. The ring B is a strong cast iron element turned larger than the bore of the cylinder and is cut diagonally at one place. Two cast-iron rings A A are turned an easy fit to the cylinder and are not split.

The special feature in the combination of these rings is that while they are free to adjust themselves



to any slight wear either outwardly or laterally, the outward pressure of the strong spring ring B is held in check by the two undivided or bevelled rings A A. The pressure either of the spring or any steam that may get in behind is carried by the inner sides of the piston head instead of by the cylinder walls as in the ordinary case. In this way the friction is reduced to a minimum.

It will be noticed that the bevels are so arranged that the wear which takes place between the flanges of the piston head will allow the spring ring B to expand and follow up any slight wear that may take place between itself and the cylinder. It will be recognised that for piston valves, this construction has considerable merits, it having no loose parts; the rings being limited in their outward tendency, they easily pass the ports; and barrelling is rendered practically impossible.

ELECTRICAL NOTES.

(*From our Own Correspondent.*)

Commutator Requirements.

In these days of high-speed turbines, the building of commutators driven by these engines requires special design for the purpose. The question of centrifugal force has to be considered. The segments have to be specially clamped and long to give the required brush surface. The question of balancing is also important and making the commutator as solid as possible tends in the right direction in this respect, but a machine may be in balance very well at the start, but when heated up and expansion occurs, then trouble sets in because distortion commences. It is to avoid this that various devices are employed by different makers. A usual method to compensate for expansion is to fit cone rings on the shaft at each end so that there is no risk of slacking at any time, and as the commutator gets hot, it will still, by the sliding longitudinal expansion, remain tight on the shaft. The angle of these cones depends on the length and diameter of the commutator and must be very correct to suit the particular necessities of each case.

The Shape of Brake Solenoids.

We all know of the plunger action of solenoids and the important part these details play in electrical design. A well-known instance is in connection with band brakes and the hold that is exerted as current is turned on is found to be from three to four times as strong if the magnet ends are coned instead of being flat. The reason for this is that the pull varies with the product of the square of the density and the area of the plunger, and in the case of a flat end, the area presented is obviously less than where it is coned, and not only so, but the coning gives a shorter air gap for the current to pass over, as will be seen by drawing a diagram. There is thus a gain in every way, while the stroke remains the same. The pull is also steadier and more even, which is another advantage from this modern form.

Magnetic Brakes.

A common method of actuating brakes, whether for hoists or cranes is for the weight of the plunger to tighten the band on the brake wheel and when the current comes on to release. This type may be called an automatic brake with negative action, so that the machine can work only when current exists in the magnet coil and the plunger is raised. Such an arrangement ensures automatic braking when the power is off or there is any defectiveness in the circuit. A drawback, caused by the endeavour to give automaticity, is that the greatest pull has to be given when the plunger is in its lowest position and the air gap the longest, with the magnetic flux at the minimum. In the case of a non-automatic brake, the conditions are different, the weight of the plunger releasing the brake, and the current tightening it. The pull then comes on when the air gap is the smallest and therefore the magnet will have much less dimensions for the work required.

Speed Control of Motors.

This is an important question at the present time for running machinery of various kinds. There are various ways of effecting the desired object, but if to be done without gearing it means the field control must be varied to give changes of speed, but less current can pass through the armature, and, therefore, though the motor runs steadily, to furnish a given output the motor must be larger than one built for the same output at normal speed. A 4-H.P. motor at 400 revs. will give only 1 H.P. at 1600 revs., and it is therefore obvious the motor must be very large in this case. By another method we can increase voltages at the armature terminals and vary the speed without increasing the size of the motor. A 250-volt circuit can be divided by a motor generator set run from the main series of the principal generating set, which splits the voltage of the mains into 60, 80 and 110-volt steps, but to obtain the full output at low speed the current must be increased, entailing an expense in wire for wiring the low voltages, and there are other difficulties, still it is a system that works well. Again, in a three-wire system with 110 and 200 volts a variation of 4 to 1 can be obtained as follow: A 2-H.P. motor being available and at higher voltage giving 800 revs., at 110 volts and full field it will give 1 H.P. at 400 revs. The motor must now be speeded up through a range of say, 60 per cent., and then the voltage changed to 220 and full field for a further increase. With a weakened field to follow the speed can be doubled and at 1600 revolutions there will be no difficulty in commutation. We have only been enabled to touch on the matter, but it summarizes the question approximately.

The Thames Ironworks, Shipbuilding and Engineering Co., Ltd., has appointed Mr. John Fisher, late of Harland and Wolff, Ltd., Belfast, as the manager of their dry dock department, vacant through the death of Mr. Austin Doe.

Holzapfel's Compositions Co., Ltd., inform us that during the first six months of the present year they have coated over 6,818,884 tons of shipping, which is an increase of more than 1,000,000 over the first six months of 1907.

Institute of Marine Engineers.—The Denny Gold Medal, provided for by the late Peter Denny, LL.D., and awarded each session for the best paper read before the Institute of Marine Engineers, has been awarded to Mr. Robert Elliott, B.Sc. (member), of Greenock, whose paper on Repairs to Ships (Part I., Repairs to Hulls, and Part II. Repairs to Machinery), read October 28th and November 18th, 1907, has been adjudged the most meritorious of the papers read during session 1907-1908. The paper embodies a great number of Mr. Elliott's observations during a long experience as a surveyor, supervising vessels of every description and encountering defects in almost every conceivable form, and forms a work of much practical utility. His many friends will be pleased to hear of his success.

The "Rohilla," built for the British India Co. by Harland & Wolff, and launched about two years and a half ago, is one of the steamers chartered by the Government for the transport of troops to and from India, and has been fitted out for the purpose in the Royal Albert Dock. The *Rohilla* is 460 ft. long by 56 ft. by 34 ft. 6 in., and is fitted with twin quadruple balanced engines and ample boiler power to maintain fully the rate of speed required on the special service. The boilers are fitted with Howden's system of forced draught. The fire-extinguishing apparatus is the Clayton system by sulphur fumes. The refrigerator for the provision chamber is the Haslam cold-air machine. The electric light engines are by Matthew Paul & Co., Dumbarton, and the installation by Holmes; ventilation is by means of ducts led through the living quarters, the air being impelled by large fans, in addition to which there are small fans fitted in the cabins and in the saloon. The heating arrangements are by means of steam pipes and radiators. The ship herself and all her appointments are excellent, giving pleasure to the visitor privileged to see and appreciate the taste displayed in her general arrangements. The cargo gear is on the hydraulic system supplied by Brown Bros., Edinburgh, so that the noise consequent upon the working of steam winches is absent. The accommodation for the troops in the 'tween decks is in the hands of Lester and Perkins, acting under the instructions of the Admiralty officials, and the workmanship as well as the material gives proof of a good choice. The galleys, lavatories and wash-houses are being fitted by McWhirter, Roberts & Co., whose long experience in the class of work necessary qualify this firm to carry out the arrangements with expedition—meeting the requirements with full knowledge of the situation. The *Rohilla* is booked to sail from Southampton on September 3rd for Bombay, and is fitted to carry 1250 men, 100 women and children. The saloon accommodation is fitted to carry 97 passengers in the first-class and 58 in the second class. This accommodation will be occupied by the officers who accompany the troops. The *Rohilla* has made several voyages to Calcutta on the usual route of the British India Co., and has given a good account of herself, and expectation runs high that she will stand well with the other transports following her sailing from Southampton, and which are being prepared at that port, these being already fitted out to some extent, having served previously as transports during last season. The sister ship to the *Rohilla* is fitted with turbines, and as she will be running over the same ground it will be most interesting to watch the course and note the results; these will serve to indicate the comparative advantages of the reciprocating and the turbine engines.

Industrial and Trade Notes.

THE CLYDE AND SCOTLAND.

(From Our Own Correspondent.)

Shipbuilding Output and Contracts. — Notwithstanding the depression, and incidentally serving to deepen it, the launches from the Clyde shipyards have been numerous and important during August, or rather for that period of it down to date of writing, when several additions to the output are pending. The month's output will probably reach considerably more than the average figure for the period. During six consecutive days, from the 6th to 15th ult., six vessels aggregating close on 30,000 tons were sent off the stocks. These included the *Morea* of 11,500 tons, built by Barclay, Curle and Co. for the P. & O. fleet, being the largest vessel yet built by this firm, and the largest in matter of tonnage of the P. & O. fleet; the *Otaki* of about 6000 tons built by Denny and Bros., Dumbarton, for the New Zealand Shipping Co., and notable as being the first steamer to be launched having a combination of turbine and reciprocating engines for propulsion, and the *Jinga*, a large suction pump and discharging dredger built by Simons & Co., Renfrew, for the Bombay Port Trust. While fresh orders are not altogether absent the amount of such work is not at all commensurate with the volume of output, and most of the yards in consequence are showing greater depletion. At the large establishment of William Beardmore & Co., Dalmuir, there has been absolutely no building work on hand since the departure of the Pacific Steam Navigation Co.'s steamer *Orcoma* about four weeks ago. The great body of workmen have consequently been paid off and the prospects of their being engaged again in the near future are far from bright. On good authority, however, we learn that there is a strong likelihood of one, or perhaps two, steamers for the Pacific Company similar to the *Orcoma* being arranged for shortly.

New Turbine Steamers.—Messrs. William Denny & Bros., Leven Shipyard, Dumbarton, have secured an order from the Lancashire & Yorkshire and London & North-Western Railway Companies to build two turbine steamers for their service between Fleetwood and Belfast. Although the Midland Railway Co.'s turbine vessels have done extremely well on the route from Heysham the adoption of turbines in the case of the new vessels for the Lancashire & Yorkshire Co. was rather unexpected. The advantages of the turbine-propelled steamers for cross-Channel port-to-port purposes have been, of course, made evident to this Company as well, but the river Wyre, by which Fleetwood is approached, was considered as being possibly too tortuous for turbine propelled vessels. However, it has ceased to be a reproach to turbine steamers that they possess poor manœuvring qualities, and the order just placed affords excellent confirmation of the way in which turbines are now regarded in this respect. In the shipyard of Messrs. Denny, who have deservedly won high renown in connection with turbine propulsion, an event took place on the 15th ult. which marks a further development in the turbine system of propulsion for vessels in which moderate speed, or even high speed combined with periods of economic driving, are essentials. This was the launch of the twin-screw turbine steamer *Otaki*, built to the order of the New Zealand Shipping Co., Ltd., London. The machinery of the vessel consists of a combination of reciprocating engines and turbines. The principle of the experiment is that the steam is first admitted to each of the triple-expansion engines, which drive the twin screws, and then passes to a centre turbine driving the centre screw before reaching the condenser. In this way fuller advantage is taken of the expansion of the steam. The idea of a combination of reciprocating engines and turbine engines, if not originally conceived by the Hon. C. A. Parsons, the inventor of the turbine engines, has been strongly urged by him and has doubtless received considerable attention of a practical kind from shipowners and engineers in various quarters. The *Otaki* is the first vessel yet launched in which this combination of propulsive machinery is adopted. From the departure a very considerable economy is expected, and, as was remarked by Col. J. M. Denny on the occasion of the launch, scientific calculations are so accurate nowadays that there is little doubt these expectations will be realized. If so, the New Zealand Shipping Co., Ltd., who have had the pluck to go in for the experiment, will deserve much of the credit and profit attaching to the step.

Shipbuilding Contracts.—Messrs. Alexander Stephen and Sons, Ltd., Linthouse, have received an order from Messrs. Elder & Fyffes, Ltd., London, for a new steamer for the West Indian fruit trade. The vessel will be of 4000 tons gross, and will be similar in design to two vessels built two or three years ago for the same owners. These were the *Barranca*, launched in March, 1906, and the *Nicoya*, launched a year earlier. Messrs. Bow, M'Lachlan & Co., Ltd., Paisley, have contracted through Messrs. Wallace & Co., naval architects, Glasgow, to build a steam water barge, 90 ft. in length, for foreign account. The Campbeltown Shipbuilding Co., whose yard has been closed for over two months, have booked a contract with East Coast owners for a screw steamer of about 2000 tons deadweight, to be delivered in March. The Dundee Shipbuilding Co. have lately received an order from the Dundee and Newcastle Steam Shipping Co., Ltd., for a new steamer suitable for coasting trade to replace the screw steamer *Alderney*, which for about a quarter of a century has regularly traded between Dundee and Newcastle. The keel of the new vessel, which is to be somewhat larger than the *Alderney*, has been laid, and it is expected that before the end of the year she will be ready to take up service between the two ports.

Oil Carriers.—The shipbuilding work on the Clyde during July and August has not been without indications of the extent to which bulk oil transport is now figuring in the world's shipping. On July 1st the Greenock and Grangemouth Dockyard Co. launched from their Greenock yard an oil tank steamer, named *Pure Light*, built to the order of the Pure Oil Co., New Jersey, U.S.A., Hamburg and Rotterdam. She will carry 7000 tons of oil on a light draught, and her dimensions are 380 ft. by 51 ft. by 30 ft. The oil will be carried in twenty oil-tight compartments. On August 7th the speed trial took place of the new screw steamer *Tamarac*, built by Messrs. Napier & Miller, Old Kilpatrick, for the Anglo-American Oil Co. This vessel is specially designed for oil carrying in bulk and is fitted with all the latest appliances for the rapid handling of such cargoes. They have a second and similar vessel on hand for the same company, and other six vessels are completing elsewhere—one at Messrs. Swan, Hunter & Wigham Richardson, Wallsend; one at the Palmer Co., Jarrow; one at Messrs. Wm. Gray and Co., Hartlepool; and one, launched three weeks ago, at the Grangemouth yard of the Grangemouth & Greenock Dockyard Co. Two others are also building in Germany.

Honour for a Clyde Engineer.— The recent notable achievement of the *Indomitable* has strongly interested the people of Clydeside, and the distinction of M.V.C. conferred by His Majesty King Edward on Mr. Alex. Gracie, the managing director of Fairfield, as representing the establishment responsible for the production of the great cruiser, is considered as only a well-merited token of the good work accomplished, while at the same time hopes are entertained that other substantial rewards may well lie behind in the matter of important naval work to be entrusted to the same establishment. The honour conferred upon Mr. Gracie, while a personal one, may not unnaturally be regarded as a recognition of the famous Govan establishment, whose directorate includes such distinguished men as Sir Digby Morant and Dr. Francis Elgar. Mr. Gracie, it should be added, was selected by the Admiralty as one of the committee appointed to confer on the matter of the design of the three "mysterious" cruisers, of which the *Indomitable* is the first to be completed. If the *Inflexible*, produced by the Clydebank establishment, and the *Invincible*, turned out by Sir William Armstrong, Whitworth & Co., do as well in their trials as the Fairfield cruiser has done, then there will be no doubt as to the success of the design, regarding which there has been so much speculation. Mr. Gracie is the son of an Argyllshire farmer, and he owes much of his success to the characteristic tenacity of the Celtic race. He is a self-made man in every respect, and in mastering the details of shipbuilding and engineering he has brought credit, not only to himself, but to the renowned firm with which he is associated.

Clyde Navigation Trust.—The next meeting of the Clyde Navigation Trustees, which falls due on Sept. 1st—our day of publication—will be accompanied and signalized by events

and incidents which will mark even more than the proverbial "red letter day" in the history of one of the most important Glasgow public bodies. The day named marks the jubilee of the Clyde Navigation Trust as a corporate body, the first constitution of the Trust having been granted in 1858. Three years ago, when the constitution of the Trust was increased in membership from twenty-five to forty-two, it was decided to extend the existing premises at 16, Robertson Street, not only for the accommodation of the additional Trustees, but of the officials who had, like the revenue, almost doubled since the then-existing building was erected in the early 80's. The formal opening of the extended and really imposing building, which now has an outlook on the Broomielaw, will take place on September 1st, and in the evening the annual dinner of the Trustees will be held in the new hall, which forms the most important feature of the interior. The new portion of the enlarged building which occupies the corner of the Broomielaw harbour thoroughfare and Robertson Street, harmonizes most admirably with the old, and generally speaking, the architecture of the whole, especially the sculptural detail, makes the pile one of the most interesting in Glasgow. Included in the detail referred to are two beautifully carved groups symbolic of the shipping trade of the harbour, and statues of Henry Bell, James Watt and Thomas Telford, all of whom contributed largely by their genius to make the Clyde the great river that it is. As is customary the major portion of the anniversary day will be spent by the Trustees and shipping friends in an inspection of the harbour and length of river under their jurisdiction, particular attention, of course, being devoted to the new works and extensions proceeding at various parts. The most notable of these is the extension of the harbour proper and the formation of the tidal basin at Yorkhill.

THE TYNE.

(From our Own Correspondent.)

The Trade Outlook Unchanged.—It is not too much to say that in the shipyards the aspect of affairs is even worse than it was a month ago. Some launches have taken place, and it has not transpired that the vacated berths are likely to be soon filled. One or two of the laid-up vessels in the Tyne have been recently chartered, but the withdrawal of these from the ranks of the "unemployed" unfortunately does not lessen the number of the latter, as a few more boats, for which the owners cannot find remunerative work, have been added. The Elswick yard of Messrs. Armstrong, Whitworth & Co., is still keeping busy; but the state of affairs at the Company's Low Walker Yard is not so satisfactory, the tendency being towards greater slackness. Most of the berths at Messrs. Hawthorn Leslie & Co.'s yard are still empty; but the firm have a considerable amount of repair work to deal with, among the vessels in hand being the torpedo destroyer *Ghourka*, which received some damage lately. The firm have just booked an order for a large cargo steamer at a very low price.

Repair Work Diverted.—Two large oil steamers belonging to a company which for years past has sent its boats to the Tyne, when repairs were wanted, have recently been sent to repairing yards on the West Coast to be surveyed and extensively overhauled. This loss of work to the district is traceable to no other cause than the strike of the "white squad," which, before its close some weeks ago, had caused a general dislocation of trade throughout the shipbuilding and ship-repairing centres of the north-east coast. Besides the vessels referred to, a good deal of other work was diverted, with the result that thousands of men are now amongst the unemployed on the north-east coast, who might have been at work had the carpenters and joiners been more amenable to reason in the earlier part of the year. This is an object lesson that can be read by all, and it is to be hoped it will have its due effect upon those immediately concerned.

Messrs. Swan, Hunter & Wigham Richardson.—Were it not for the acquisition of pontoon building contracts, this mammoth establishment would not be able to keep its machinery fully going. For, high as is the company's reputation for good work and prompt delivery, they could not at the present time secure orders for ships to keep more than a third or so of their building berths occupied. Long before the works had attained their present dimensions, however, they had become famed for the production of floating docks, and it is not surprising that so far as this kind of work is concerned, they hold the foremost place, both as regards quickness of despatch and output. The Company's own pontoons and graving docks are just now being pretty fully utilised, there being a considerable amount of repair work in hand.

New Graving Dock at Jarrow.—The formal opening of a third graving dock by the Commercial Dock Co., Jarrow, was an event that aroused considerable interest, as showing that this firm, at all events, are not unhopeful as to the future. The firm's operations, up to now, must have been singularly successful to have afforded grounds for entering upon so expensive an enterprise, and it is to be hoped that future results will prove their optimism to have been justified. The Northumberland Shipbuilding Company have still a fair show of work on the stocks, and it is reported that an order for a large steamer has been recently secured. The Tyne Shipbuilding Company have their berths fully occupied, and at Messrs. Readhead's yard rather more activity exists than was noticeable some weeks ago. The Smiths' Dock Company are well off for orders both in the new work and the repairing departments, and other firms at North and South Shields are fairly well employed, especially in the repairing shops.

Marine Engineering.—The apparently interminable strike of engineering operatives seems to be at last nearing a settlement, and it is highly probable that this is the last occasion on which it will be necessary to refer to this unpleasant subject. We have all along held to the view that the men would have to be the first to yield on this matter, and our view is verified by the fact that they have taken the initiative in trying to end the dispute which they most wilfully began. It must be stated that they are doing this with a very bad grace, for they are taking the longest possible way of arriving at the destination they profess to have in view. They have really only one question to decide, whether they will submit to the wages reduction proposed by the masters or not. The reduction is too small to admit of any further huckstering, so that the only way of closing the matter is acceptance or rejection. To obtain the men's opinion upon this simple issue a whole month is being taken, whereas it might have been done in less than half a week. The masters' attitude with respect to this question is, at the time of writing, absolutely unknown. Should the men submit to the small reduction ($2\frac{1}{2}$ per cent.), which was the subject of contention at Easter, a proportion of them may be taken back to work on those terms. The employers, on the other hand, may revert to their original claim for a 5 per cent. reduction, on the plea—which is undeniable—that trade is much worse now than when negotiations were broken off. Should the employers refrain from making the higher claim, the public will see that they, at all events, are willing to make sacrifices for the sake of peace.

Messrs. Geo. Angus & Co.—It is announced that arrangements for an amalgamation have been concluded between the well-known local firm of Messrs. George Angus & Co., Ltd., and Messrs. George Morris & Sons, Bermondsey. Both firms are largely engaged in the leather trade; the first-named being also extensive manufacturers of indiarubber specialities, packings and other accessories for steamship and general purposes.

General Engineering Work.—At the Gateshead railway shops business is still rather slack; but an improvement in the Autumn is looked forward to. Several of the departments at Messrs. Clark, Chapman & Co. are keeping up a fair show of work; but in those departments more particularly engaged in the manufacture of steamship auxiliary machinery business has largely fallen off. Messrs. Scott and Mountain, of the Close Works, continue to be well employed in the electrical equipment of collieries, and have contracts in hand at several centres. Messrs. H. Watson & Sons, of the High Bridge Works, are still able to keep some of their departments fully going, the demand for bilge pumps and other specialities being well maintained. Messrs. Parsons' electrical engineering works at Walker Gate are fairly well off for orders and the firm's Wallsend works are also pretty busy. Iron and brass foundries are, without exception, slack, and forges are even in a worse plight, the few that are still working being only able to keep a limited number of hands employed on short time.

THE WEAR.

(From our Own Correspondent.)

Shipbuilding.—Messrs. J. L. Thompson & Sons of the North Sands Yard, are preparing to put down a vessel, which, in these days, is an event of some importance, the placing of orders for ships having practically ceased. The orders will, no doubt, come again when trade improves and the operatives have settled down to the quiescent mood which at one time distinguished them. The North Sands Yard will then, it is pretty certain, again display its old activity, as it possesses all the requisites for economical production, and in other respects still holds an advanced position. The Sunderland Shipbuilding Co., Ltd., are reported to have booked an order for a coasting steamer, and Messrs. Bartram & Sons have just launched a fine vessel for Cardiff. Messrs. S. P. Austin and Sons have obtained the contract to carry out extensive repairs to the s.s. *Lackenby*, which sustained heavy bottom damage through having been ashore. The vessel is now in their graving dock, and a good many drillers and other workmen have secured employment, which, it is expected, will last for some time. There is another vessel on the pontoon undergoing a shell repair, and some vessels in the river also receiving attention. The only change to be noted at the yards "above bridge" is that Messrs. Laing's establishment has ceased work, and all the operatives have been discharged. Nothing has as yet transpired as to future developments.

Engineering.—Quietude continues to be the feature at the marine engine works, and in the aspect of affairs at the smaller shops there is no appreciable change. The foundries are still very slack and ironworks may be similarly described. Brass and copper works are doing little, and forges are on short time.

THAMES.

(From our Own Correspondent.)

The Port of London Bill.—After twenty sittings, which have been computed to cost £7200 each, this bill has been reported for third reading by the Joint Committee. Among points that may be noted as having been brought before the Committee one was to exempt the river Lea from dues, but this was not accepted. Another was an endeavour to put down a lock at Hammersmith at the expense of the new authority, but this was not agreed to. When the new arrangements are likely to come into force is not clear, but April 1st next has been talked of, and possibly three months later. So the day is not far off, with the autumn session in front and the bill to be passed, for the new body to have power. Even at this late stage, however, the Thames Conservancy are in opposition, because it does not take its loss of its position kindly. The opportunity for further discussion will occur in Parliament at the next sitting, but as the bulk of the shipping and trading opinion is favourable as the measure stands after amendment, it seems doubtful, if the Government determine to carry the measure, that opposition will have any effect. The costs of the Government at the Board of Trade in the preparation of the bill are to be repaid by the new authority, so the expenses incurred will be jeopardized if the bill should fail to pass. This does not, of course, represent the sums this and previous Governments have been put to in threshing out this matter, while the London and India Docks have spent £30,000 in defending themselves on the various occasions the matter has been brought forward. With the public expenditure incurred at this and previous enquiries it will be seen there is a very heavy outlay to be accounted for, and it is not likely, therefore, that any opposition will be allowed to stand in the way of carrying the matter through after it has passed the Committee.

Dock Co. Meeting.—The London and India Docks Co. has presented its half-yearly report, which shows a decrease of 17,000 tons in shipping from foreign ports and 21,000 tons in coastwise traffic. In earnings by import rates on goods there was an increase of £10,426, but export rates declined by £7564, and rates and charges on shipping were £8803 less. Summarizing the net revenue there was a decrease of about £6000. Touching on the Port of London scheme the chairman argued that the terms were fair, and that though, if the matter had gone to arbitration, the shareholders might have obtained more, it would have been a slow process and fraught with difficulties. At the Millwall Dock meeting it was said there had been an increase of ships entering the dock, but a decrease in tonnage of 8409 tons. The balance of revenue was £8095 instead of £6572 in same period last year.

The Regents Canal and Docks Co. declared a dividend of 2 per cent. and £402 forward.

Dock Lighterage Cases.—Several cases have come before the Courts recently as to the power of the companies to charge dues on lighters which entered the docks and were unable to discharge from various reasons, and this being so the owners asked to be exempt from dues. The Court, however, in all these cases decided in favour of the Dock Company, which is thus enabled to charge for such time as the lighter is using the docks for whatever purpose she may be there. This is the effect of the decision.

Thames Steamboat Report.—At one time it was thought and given out that the L.C.C. had sold their boats, but it appears that such was not the case. Meanwhile, we have the figures to March 31st last before us, not very interesting reading. The deficiency in working for the twelve months was £37,847, and up to the same time the capital expenditure had been £216,018 in respect of boats, coal hulks and moorings, and £85,062 as regards piers.

Mercantile Marine Training.—While a Liverpool Co. is taking fresh steps to provide themselves with officers trained in sea-going ships, the experiment from the London river by the *Port Jackson* has failed for want of funds, and the Marine Society has to report a deficiency in expenses incurred in sending this vessel on an eight months' voyage to Australia. Of course, this does not interfere with the work carried on on the *Warspite* on the Thames. Another ship on the Thames that has a good report to make in this way is the *Cornwall*, moored off Purfleet, which has lately held its annual sports, at which high encomiums were passed on the boys and their training by those that were present.

NORTH-WEST OF ENGLAND.

(From our Own Correspondent.)

Prospects.—The prospects in the shipbuilding and engineering trades of the North-west district do not seem to have undergone any material change during the month. No fresh orders have been booked, although the firms have been busy tendering for a lot of work. There seems to be a feeling that before long there will be an improvement in the trade in the district, and such a change will be welcome. Of course Barrow is really better situated than many other centres. For one thing, this district has not had the trouble of the engineers' strike to contend with. The wood-workers are at present not doing much, nor will they until the British and Brazilian "Dreadnoughts" are more advanced. The gun-mounting departments are very slack, and the engineering departments will soon require more work to keep the hands going. There is some talk of naval work being more extensive and that both the British Government and foreign Governments will be requiring warships soon. The Chilian Admiralty are likely to want some vessels and there is the talk of them placing orders in this country. Not only Chili, but many of the South American countries will have to be getting vessels if they wish to keep pace with Brazil, that is, of course, if the last-mentioned country intend to keep the "Dreadnoughts" and can withstand the possible offer of another power.

The Brazilian "Dreadnought."—Many papers in their desire to keep the pot boiling during the dog days seem to have hit upon the Brazilian "Dreadnoughts" as subjects for enlarging upon and for writing up. Great "mystery" has surrounded the building of these "22,000 ton Dreadnoughts," "the most powerful in the world," etc., etc. Such has been the tone of some of the articles. Japan, America, United States and Germany were all to become the owners, unless Britain were forced to buy them for her own safety. The most of it has been absolute flap-doodle. Where the mystery comes in is difficult to know. The facts are these. Brazil at first decided upon six war vessels, not of a large type. Then they changed their minds. This is not to be wondered at, considering that Brazil is a republic. Vickers, at Barrow, were to build two of these proposed vessels and Armstrongs four, and Vickers were to engine the lot. Then "Dreadnoughts" were decided upon. Vickers were to build one, Armstrongs the other, and a third was proposed, and this was to go to Armstrongs. The cost of the two will be only about one-eighth

less than the total cost of the six smaller ones. It is about two years ago that the building commenced and the launches will probably take place in the beginning of next year. Vickers are building the boilers and engines for both these vessels. The delay in the building has been very great, and is due to a very obvious reason. That same reason accounts for the third vessel being still on paper. Several journals have this vessel near completion, and one had her building on the Clyde, which proves very conclusively that they did not know what they were writing about. That a third will be built is more than likely, but before it is Brazil will have to possess more money for naval construction than it does at present. The two constructing, the *St. Paulo.* at Barrow, and the *Minasgaves* at Armstrongs, on the Tyne, are to be driven by reciprocating engines, and are designed for a speed of 21 knots. For comparison, it is interesting to note that the "Dreadnought" *Vanguard*, building at Barrow, is turbine-driven, has 2,000 more horse-power and still only 21 knots speed. This confounds the "22,000 tons" theory.

Are they intended for Brazil? This question has been answered in twenty different ways. Brazil is building and paying for them. Brazil will take them—if there are no tempting offers from elsewhere. It was stated some time ago on very good authority, when America and Japan were almost quarrelling, that America would certainly become the possessors, and there is very little doubt about it. But America and Japan have straightened things up and the odds are now that they will go to South America. They may be needed there before long, for none of the South American countries love each other and the one with most power can say the most in a quarrel. Of course, on the other hand, they may be another eighteen or twenty-one months on the builders' hands, and one never knows what may crop up in that time. As far as this district is concerned, it is hoped that the vessels will go to Brazil and stop there. If they do, it means that the other powers thereabouts will be wanting some ships and that means more work for firms like Vickers.

The Old "Dreadnought."—Old and obsolete, rusty and ugly, the old *Dreadnought* was towed into Barrow during August to be broken up by the shipbreaking firm of Wards, of Sheffield. An inspection of this old turret vessel brings two things forcibly into one's mind. One is the absolute uselessness of her in these days and the other the great strides that have been made in naval design these last thirty years. Her lines would startle the present-day naval architect. Anyhow, she was one of the bulwarks of Britain once and one of the best in her day. She has been lying up in the Kyles of Bute for some time and has every appearance of it. The following is an interesting comparison of the old *Dreadnought* built at Pembroke in 1875 and engined by Humphreys, of London, and the *Dreadnought* of 1906 built at Portsmouth and engined by Vickers, of Barrow.

	1875.	1906.
Built of	Iron	Steel.
Displacement..	10,820 tons..........	17,900 tons.
Length	320 ft.	490 ft.
Breadth	63 ft. 10 ins.	82 ft.
Draught	26 ft. 9 ins.	26 ft. 6 ins.
I.H.P.	6,500	24,712.
Speed	13·7 knots	21·25 knots.
Bunkers	1,200 tons	2,700 tons.
Armour	side, 14 ins., bulkhead, 13 ins., guns, 14 ins.,	belt, 11 ins., heavy guns, 11 and 8 ins.
Guns	4 12·5 ins. muzzle loading, 25 smaller guns and q.f. 2 torpedo tubes.	10 12 ins. B.L. 27 quick firers, 5 torpedo tubes.
Cost	£502,573 ...... (This is not the whole cost of the vessel).	£1,813,100. (Including armour).

The "Gemini."—This peculiar name has been given to the steamer which Vickers are building to carry the two Japanese submarines out. The name has something to do with the stars, and particularly refers to those two stars known as the "Heavenly Twins." Where the connection between two heavenly twins comes in with two death-dealing submarines is difficult to understand. It may be grim humour, for the *Gemini's* cargo suggests twins belonging to a more nether region, unless, of course, the possession of these two vessels means the assertion of power and the guarantee of peace. When complete, this vessel will proceed to Liverpool and take in her cargo of two submarines by being submerged and allowing of the two vessels to float into her. This submarine carrier may lead to more work being done for foreign countries.

The Floating Crane.—This structure, which was launched last month and has been fitted by the firm of Applebys with the crane, has been completed and sailed at the end of the month for Canada. The crane is capable of lifting 75 tons.

The "Vanguard."—The work on the British "Dreadnought" is progressing favourably and everything seems to point to a launch in or about November this year. Work on her turbines, which are also being built by Vickers, is also in a forward condition and there seems no chance of the contract period of two years being exceeded. Contractors have been busy piling the ways for her and that work is almost complete now.

The New Walney Bridge.—The new Walney Bridge has been opened and there is now a fine approach to Vickers' model village. During the first week over 80,000 crossed it and in the second, over 60,000. This bridge may mean the eventual means of many industries being started on the Island. Vickers own much land over there and they may possibly decide to erect works there. They have already the wireless telegraph installation fixed by means of which they can converse with the Gun Range at Exmeals on the Cumberland coast, and also with any of their vessels on trial out at sea.

West Coast Hæmatite.—The hæmatite iron and steel trade is still in a very low condition. There is very little life in it and out of the fifty-nine furnaces in the district, thirty-nine of them are out of blast. Ordinary mixed numbers are nominally quoted at 57s. per ton net f.o.b., while warrant iron is down to 56s. 6d. per ton net cash. The steel trade is poor and the Barrow works are practically idle. The West Cumberland works have a little work and have booked some small orders for rails at about £5 17s. 6d. per ton. There is some chance of the trade in shipbuilding material improving for there is certain to be an increased demand shortly. Belfast is favourably situated to Barrow and as it is expected that Harland & Wolff's are to be busy in a few months on the construction of several big vessels, including the rumoured 960 ft. long Western Oceaner, our local works may stand a fair chance of booking some of the work. One thing, by then the Barrow works will about have completed their new gas plant, which is expected to bring about a big saving in the coal bill and this will enable them to quote better.

Shipping.—Shipping is very bad indeed and freights are down to a very low figure. Several vessels, which have brought in cargoes are lying up. The exports of iron and steel up-to-date this year are very poor. The total this year, as compared with the same period of 1907 is no less than 260,000 tons behind.

SOUTHAMPTON.

(From our Own Correspondent.)

Messrs. J. I. Thornycroft & Co.—The Admiral-superintendent of contract-built ships and the officers of the Portsmouth Division of the Home Fleet, inspected H.M. 1st-class torpedo boat No. 20 on the 18th August, and on the following day the vessel proceeded on her commissioning trial (two hours at sea) and was subsequently handed over to the officers of the Portsmouth Division of the Home Fleet.

H.M.S. torpedo-boat destroyer *Amazon* was successfully launched on Wednesday, July 29th.

H.M. 1st-class torpedo boats Nos. 31 and 32.—Work is steadily progressing on these two vessels. There are five twin-screw cargo steamers for Argentina rapidly advancing in construction.

An order has been received for a powerful tug and a cargo flat for service on Chinese rivers. The Portsmouth dockyard authorities have placed orders with Messrs. Thornycroft for a large amount of work to bridges and platforms in connection with *Fisgards* and tank vessel *Faithful.* The shipbuilding berths are well filled and the work of repair on several vessels is proceeding.

Proposed New Dry Dock.—A scheme is under consideration for the provision of a new dry dock which will eclipse the present Trafalgar Dry Dock, but there has not been any further official statement and this cannot be looked for

until the scheme is fully matured. It is probable that the London and South-Western Railway Company will promote a bill in Parliament at an early date, when it will be possible to get a clearer idea of the company's intentions. Additional dry dock accommodation is a pressing necessity, and by the provision of the new dock vessels larger than anything now afloat, or likely to be constructed in the near future could be expeditiously docked. The site of the new dock will probably be in the vicinity of the Trafalgar Dock, between it and the Town Quay.

The s.y. "Eros."—This vessel, whilst at anchor off Hythe, was sunk by collision with a collier some months ago, a large hole being knocked in her starboard side. The yacht was owned by J. P. Houston, Esq., of Liverpool. A party of friends and the crew narrowly escaped before the vessel sunk. Fortunately, the water was shallow and the vessel was subsequently raised and brought into dry dock for repair, and was then removed to the inner dock. She has lately been purchased by the Liberian Government for the suppression of smuggling. The vessel has now left the dock and taken up a berth near the Royal Pier, where she is shipping her guns. The Mayor of Southampton paid an official visit before the vessel sailed for Monrovia.

The s.y. "Sagitta."—We gave full particulars of this fine yacht on the occasion of the launch, which took place from the yard of Messrs. Day, Summer & Co. in February last. The yacht has just completed her trials and has been handed over to her owner, the Duc de Valencay, at Gosport, where she has been completing at the yard of Messrs. Camper and Nicholsons, who were responsible for her design. The work of construction of hull and machinery was sub-let to Messrs. Day, Summers & Co., of this port. The official trials took place in Stokes Bay at the end of July, when a speed of 15·2 knots per hour was obtained, which is considerably in excess of the speed demanded by contract. The engines developed 1600 I.H.P., which is also in excess of contract requirements. Later exhaustive steam trials were run to ascertain the coal consumption, which worked out to 1·5 lbs. per I.H.P. per hour over a period of twenty-four hours, the speed being 10 knots. The dimensions of the vessel are 190 ft. 9 in. on the water line, 29 ft. 7 in. beam and 16 ft. 10 in. depth, and she has a tonnage of about 800 tons B.M. The engines are inverted direct-acting triple expansion, having cylinders 18 in. by 30 in. by 48 in., with a stroke of 30 in. Steam is supplied by two return-tube multitubular boilers working at 180 lbs. pressure per square inch. Messrs. Day, Summers & Co. are to be congratulated on this splendid performance, and for the expeditious manner in which their part of the contract was performed.

The Hamburg-American liner *Oceana*, better known as the *Scot*, has come here for repairs after having been aground at Inchkeith. At the time of grounding she had about 200 passengers aboard on a pleasure cruise to the North Cape *via* the Firth of Forth. The damage sustained proved to be too serious to allow of the vessel proceeding on the cruise, and the company's *Fürst Bismarck* picked up the passengers and continued the cruise. The reason the vessel came here for repairs is in consequence of the labour disputes at Hamburg.

September commences the trooping season, and preparations are being made for the work required to enable the various toopers to commence the season's work. The *Plassey* came up from her berth down the river and work is proceeding on board.

The *Dongola* has also come up to the docks and is fitting out.

The *Assaye*, one of the rejected troopers, left Southampton on Saturday, August 15th, for London, and sailed in the P. & O. service on Friday, August 21st. The *Sicilia* is not now a trooper and sails from London on October 10th, also for the P. & O. Co. in their China and Japanese service.

HULL.

(*From our Own Correspondent.*)

SINCE my last report appeared, there is nothing of special importance to advise in regard to general business matters at this port. Business appears to be fairly quiet all round, and although an average number of tramp steamers have arrived here since my last report appeared, the regular berth boats, both outward and homeward, are only receiving moderate support.

The Royal Mail Steam Packet Company have been making a Norwegian cruise with one of their finest steamers, *viz.*, the *Amazon*, and Hull was included as a port of call for the embarkation of passengers for the tour. The *Amazon* arrived here on the 1st August on her outward journey, and disembarked the passengers on the 15th August, after a fourteen days' cruise. We are informed that regular cruises will be made by the Royal Mail Steam Packet Company's "A" class of steamers during the next summer season, and the port of Hull will be included in the itinerary.

Earle's Shipbuilding and Engineering Co., Ltd., Hull.—In addition to small vessels they have in course of construction a large cargo steamer for Messrs. Brown, Atkinson and Co., Ltd., of Hull. They have also just completed machinery for a Belgian vessel. The trial trip of this ship took place last week, when the most satisfactory results were obtained. They have also in hand several sets of machinery for vessels building at other ports, likewise several vessels in their works undergoing extensive repairs.

Cooper & Co., engineers and ship repairers, unfortunately are not very busy, and we can only report that they are fairly well off for repair work and have a number of new propellers in hand.

The Hull Central Dry Dock and Engineering Company are exceptionally busy with repair work for the time of the season, and their dry dock is kept fairly well going with dry docking and painting vessels. We are informed that this company has ordered some heavy machinery, including a large pair of rollers, so that the largest plates made for ships' use can be dealt with.

BELFAST.

(*From our Own Correspondent.*)

Messrs. Harland & Wolff.—It is expected that the lengthening of the two slips for the big White Star liners will be completed by November, when the keels of these vessels will immediately be laid. As is already known, they will exceed the new Cunarders in point of size, though not in speed. Their length will be about 860 ft., and gross tonnage close on 50,000, while the speed will be 19 or 19½ knots. The propelling power will probably be obtained from a combination of turbine and reciprocating engines, as is being fitted in the case of the White Star liner *Laurentic*, which will shortly be launched from the south end of the Queen's Island for the Company's Canadian service. On 13th August Messrs. Harland & Wolff launched the new twin-screw steamer *Leopoldville*, which has been constructed by them for the Compagnie Belge Maritime du Congo (Managers, Messrs. Elder, Dempster & Co.). The vessel is 400 ft. long, by 53 ft. beam and 6500 gross tonnage. The 150 tons floating crane, referred to in previous issues, which is being built for Messrs. Harland & Wolff, will be tested within a few days of writing. The barge on which the crane is constructed is 150 ft. long by 86 ft. broad and 13 ft. deep. It carries 800 tons of ballast to counterbalance the weight of the crane and maximum load. The total height of the crane from the deck is 230 ft., and with the jib at extreme radius it will swing a load of 150 tons a clear distance of 150 ft. The crane will be tested with 200 tons load.

Messrs. Workman, Clark & Co. have received an order from Messrs. J. P. Corry & Co., London, for two steamers of between 8000 and 10,000 tons. The entire fleet of well-known Star Liners has been built by the same firm. Within a week of writing they will launch two large steamers, the Holt liner *Theseus* and the *Tainui* for the Shaw, Saville and Albion Company.

Harbour Electric Tramway.—Since last month's notes were published the electric tramway to the Alexandra Dock has been completed, and the service opened. The cars run from Castle Junction to the terminus at the entrance to the new graving dock at present in course of construction, and are proving a great boon to those who have business with the shipyards and engine works. At "knocking-off time" large numbers of workmen's cars are run from the shipyard gates to the various termini, and are being largely taken advantage of.

JUNIOR ENGINEERS.

THE accompanying illustrations of the No. 1 type of automatic boring and surfacing machine, marketed by Messrs. Geo. Richards & Co., are fully in line with modern practice in this class of work. The bed has a length of six feet and has a hand and power longitudinal feed of 34 inches and cross traverse of 36 inches, driven by separate spindles in the bed of the machine. The upper table can be revolved upon a central pivot, by means of which work can be set at various angles to the tool with a single chucking, the clamping dogs are dovetailed into the table base to ensure rigidity and accuracy, with facings at right angles to, or parallel with one another, when reversing tne table The steady bracket at the right-hand end of the machine bed is bushed for supporting boring bars when machining long cylinders, and is adjustable for height by the hand wheel above. The driving head saddle has a vertical feed of 11 inches, power driven by a vertical spindle and held rigid by a clamping bolt.

The table movements are effected by hand, by means of the cranked handle and axles, seen near the feed gear at the side of the bed, the power levers being placed together on top of the bed, while the lever just above these controls the vertical movement of the head saddle. These three feeds are all power-driven, independently of the spindle to facilitate setting without starting the driving gear, and are controlled from the change box seen at the extreme left end of the bed. This feed-gear case, having a cranked setting handle and pointer with a central index plate, has eight feeds graduated from ·0075 to ·13 inches per revolution of spindle, all of which are governed by the reverse box handle, on the right hand side of the feed case, and from which the motion is transmitted through the short horizontal shaft to the spur gearing, driving the worm and wheel, just below this shaft, which engages the spindles for the feeds by the movement of their separate levers.

The application of automatic feeds to these machines renders them adaptable for a variety of purposes in facing, boring, drilling and milling ; with the fast spindle speed, holes can be drilled at economical rates above 1, 1½ and 1¾ inch for steel or cast iron, wrought iron and brass respectively, and, owing to the rigid construction of the spindle, milling cutters can be advantageously used, without an end bracket, for work which can be brought close up to the driving head, the speeds being suitable for cutters of 2½ inches diameter and upwards.

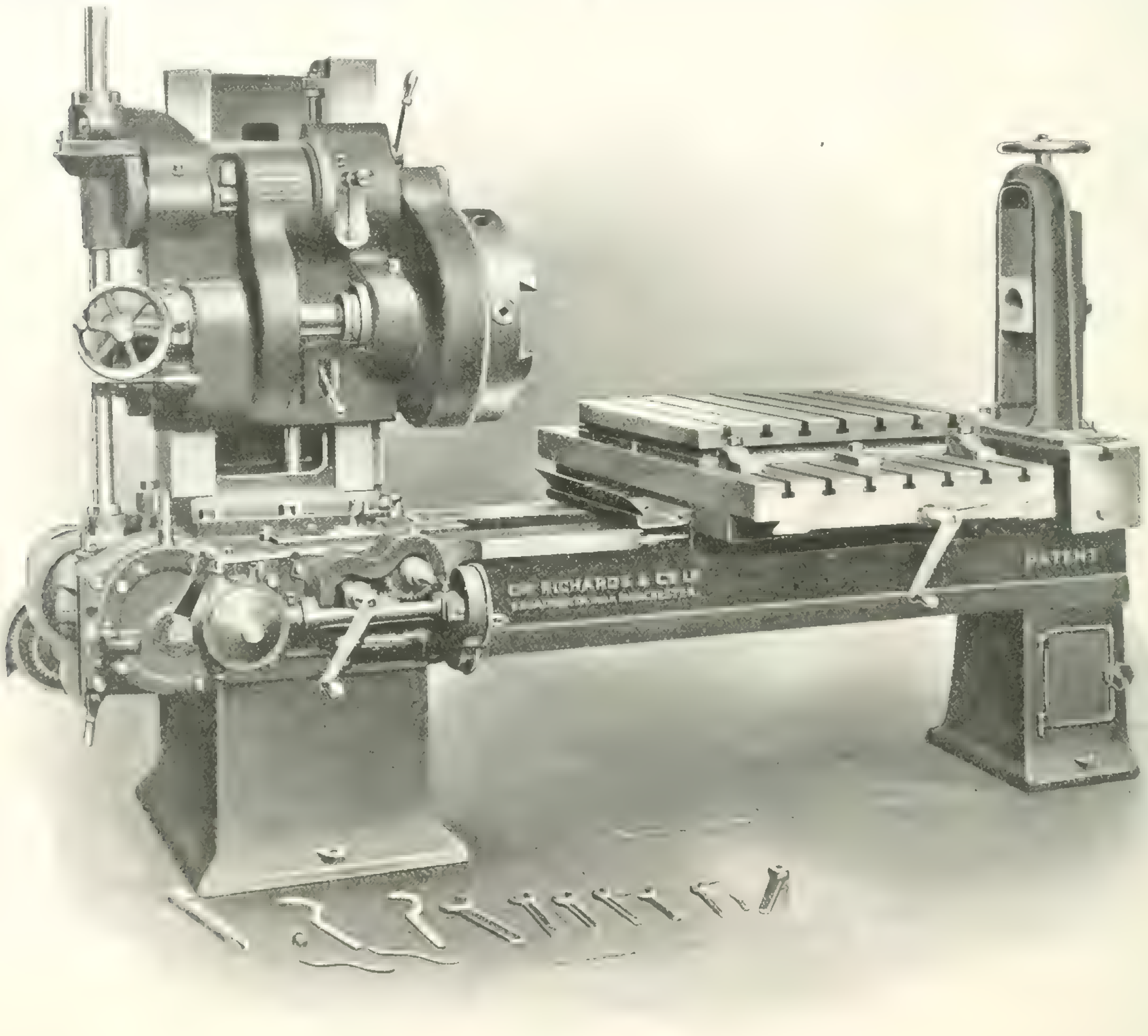


Fig. 1.

Fig. 2 shows in section the head of the plain type of machine, the driving gear being similar to that of the automatic type. The vertical spindle B, rotated by bevel wheels at A from the cone pulley, drives the horizontal pinion shaft by means of the bevel gearing at C. The pinion drives the main spindle through the large spur wheel which is keyed on and secured to the spindle by jam nuts, thus allowing for adjustment for wear of the bronze bush, which is coned to take the thrust of the cutting tool.

The tool box at E is fitted in V slides to the circular head, screwed upon the spindle, the tool being fitted into a square hole and secured with a clamping bolt ; the box has also a

facing for boring bars, special tools and milling cutters, as seen in Fig. 3. The tool feed is in a direction across the face of the head from centre to circumference or reverse, this is operated by a screwed spindle, threaded into the tool

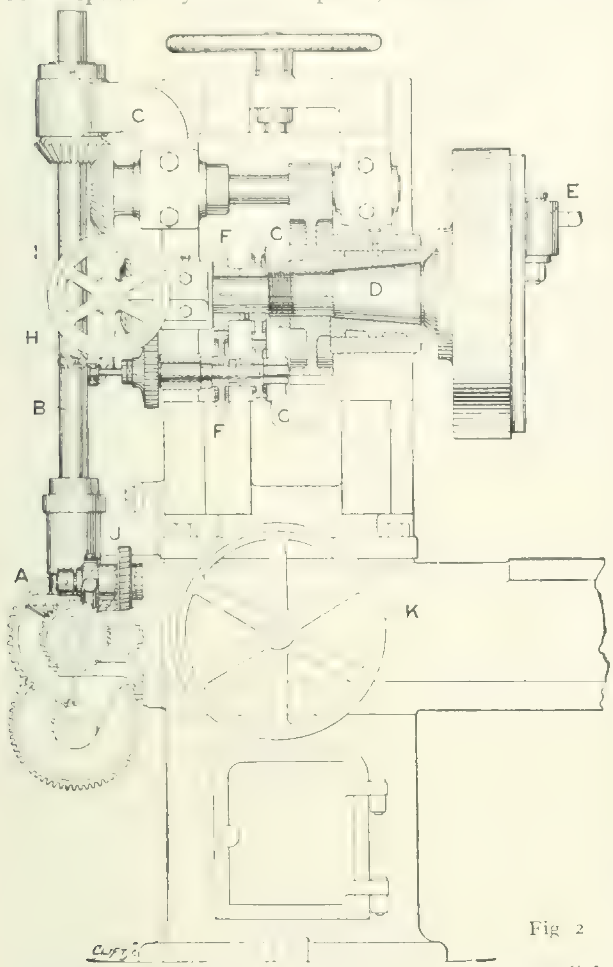


Fig 2

box, which is rotated by means of bevel wheels and a light shaft passing through the driving spindle to the power feed gear and hand wheel at I.

The function of this hand wheel I is to provide for small adjustments in the setting or feeding of the tool, the working feed being power-driven by means of the spur gearing FF

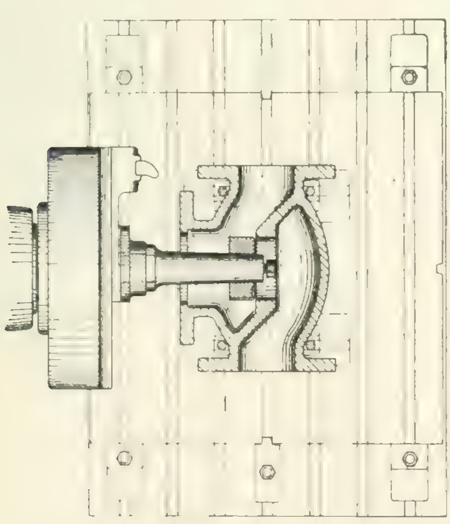


Fig 3

and GG, these being separately brought into action by the lever H; the pair of wheels FF give a roughing feed, towards the centre of the head, at a rate of 23 revolutions per inch of feed, the pair GG giving a finishing feed of $11\frac{1}{2}$ per inch outwards. For facing flanges, the tool is set at the circumference and travels inwards for the roughing cut, the finishing feed is then put on and the tool is worked outwards, thus completing the operation without stopping the machine and leaving the head clear for bringing another face to the tool; if the edge of the flange is also to be tooled, the longitudinal feed is put in gear and the rim rough cut, the back of the flange is machined for bolt heads, and the tool, passed back across the rim for finishing, is thus left in its original position.

The countershaft is equipped with two 10-inch pulleys which, by means of large and small pulleys on the line shafting, are driven at 420 and 366 R.P.M.; two speeds are thus available, without stopping the machine, to compensate for the reduction in peripheral velocity, as the tool approaches the centre; this maintains a more uniform cutting rate without retarding the tool and scoring the surface. The countershaft has a four-step cone pulley, which, with treble back gear and the two driving pulleys, gives 24 spindle speeds, ranging from 2 to 68 R.P.M. With $2\frac{1}{2}$ inch single belt the horse-power thus required is about 4 and $3\frac{1}{2}$ for the fast and slow pulleys respectively.

Fig. 3 illustrates the attachment of the boring bar; in this case a stop valve seat is being recessed by means of a flat tool fitted into a slot in the bar and secured by means of a set pin.

With such parts as small cylinders, the general utility of these machines is very evident, the cylinder can be bored and the cover joint faced, the table reversed, the stuffing box bored and faced and the feet machined, the table given a quarter-turn and the valve chest cover joint and valve face machined, and, if necessary, by means of a milling cutter, the parts trued up, the whole of the operations being completed at one setting, with the minimum of labour and changing of tools.

LABOUR TROUBLES.—During the past few weeks the strikes which have taken place in the United Kingdom, on the Continent, in Canada, India and in New South Wales serve as object lessons to those who desire to study the conditions under which capital and labour blunder along, with a view to the establishment of a better order of things. The matters which originated a few of the strikes appear to us, viewed from a distance, as of so trivial a moment that those responsible for the cessation of work seem morally criminal of causing the consequent distress to many dependents. An article on the subject of trade in the "Nineteenth Century and After," although bearing to some extent upon the difficulties of dealing with the aggregate demand for articles in ordinary use and the minor luxuries of life, does not enter into the question of strikes and how to prevent them. A comprehensive paper dealing with this problem would afford great scope for a dispassionate writer of experience.

RUBBER EXHIBITION.—The exhibition to be opened at Olympia, from 14th to 26th September, should prove of value to all interested in the rubber industry. To engineers there is a special interest in the cultivation of rubber, as a plentiful supply in the market tends to improvement in the quality used for soft packings, valves, etc., and of recent years there has been need of improvement except at prices, which one has to consider carefully and then look around for other materials to substitute in place of rubber. This has not proved an unmixed evil, as it has led to the discovery or invention of substitutes which have gradually come into profitable service. The enormous increase in the use of rubber, due to the large amount demanded for cycle and car tyres, has given such an impetus to the cultivation that much capital has been expended in adding to plantations in various parts of the world, and companies have been formed for exploiting new districts. The plantations in Imperial soil, as in Ceylon, Straits Settlements, etc., where British capital is sunk, demand our closest attention, and doubtless the exhibits and the information to be given on the subject will prove of the deepest interest to visitors. We are not aware if it is included in the programme of the promoters to arrange for lectures and demonstrations, with special facilities granted to parties from technical schools, colleges and workshops, but such appeal to us as desirable, both from an educational and an advertising point of view.

LAUNCHES AND TRIAL TRIPS.

LAUNCHES—English.

Esneh. On July [illegible]th Messrs. John Blumer & Co. successfully launched from the North Dock Shipyard a finely modelled screw steamer of the following dimensions :—Length, 348 ft.; breadth, 47 ft. ; depth, 26 ft. 6 in., built to the order of the Moss Steamship Co., Ltd., of Liverpool, for their Mediterranean service. She is of the spar-deck type, rigged as a two-masted schooner with telescopic masts, and is fitted with handsome and roomy accommodation for passengers, captain and officers on bridge deck. The vessel is lighted throughout by electricity, the work being carried out by Messrs. H. T. Boothroyd, Hyslop & Co., Ltd., of Liverpool. The steam winches and steering gear are by Messrs. J. Lynn & Co., Ltd., of Pallion, Sunderland, and the engines and boilers by Messrs. John Dickinson & Sons. Ltd., of Sunderland. Both hull and engines are being constructed under the superintendence of Messrs. Wm. Esplen & Sons, of Livperool, and are built to the highest class of the British Corporation Registry, under the special survey of Mr. J. Fraser MacDonald, their Sunderland representative. Before leaving the ways the vessel was gracefully named the *Esneh* by Mrs. Wm. Miles Moss, of Liverpool.

Coruna.—On July 30th, Messrs. William Dobson & Co. launched from their shipbuilding yard at Walker a steel screw steamer which they have built to the order of Messrs. Fearnley and Eger, of Christiania. The vessel is built to the highest class of Norske Veritas, and is of the single-deck type with the following dimensions :—Length between perpendiculars, 253 ft. ; breadth, 37 ft. 6 in. ; depth moulded, 19 ft. 9 in. A long bridge is fitted, extending from foremast to mainmast, and there is also a poop and forecastle. The vessel has been supplied with a Cochran (Annan) donkey boiler with patent seamless furnace. The machinery, which is being built by the North-Eastern Marine Engineering Co., Ltd., of Wallsend, is of the usual triple-expansion type, having cylinders 19 in., 31 in., 51 in. diameter by 36 in. stroke. On leaving the ways the vessel was christened *Coruna* by Mrs. Johannessen, wife of Captain Johannessen, who is superintending the construction of the steamer on behalf of the owners.

Konakry. — The eminent and enterprising firm of Messrs. Elder, Dempster & Co., who are always in the front in adopting the latest improvements in ship construction, have been watching for the last two years with much interest the progress of the patent cantilever - framed steamer of Sir Raylton Dixon and Co., Ltd., Cleveland Dockyards, Middlesbrough. Of this type there have been built or are building about 133,000 tons during the last three years, and Messrs. Elder, Dempster and Co. have shown their appreciation of the success this type of vessel has attained by ordering from Sir Raylton Dixon and Co., Ltd., one of the latest improved cantilever steamers. This vessel, which has been built on the patents of Harroway and Dixon, John Priestman and Livingstone & Sanderson, was successfully launched on July 30th from the Cleveland Dockyards, and is the thirtieth vessel built there to the order of Sir Alfred Jones, K.C.M.G., the chairman of Messrs. Elder, Dempster & Co. Her leading characteristics are as follows :—She is being built to the highest class at British Corporation with complete shelter deck and topside water ballast tanks under upper deck. The engines are placed right aft. Her leading dimensions are 373 ft. by 52 ft. by 28 ft. moulded, and she will carry a deadweight cargo of 8000 tons, having a measurement capacity of 10,400 tons with the very remarkable low nett register of about 2300 tons. She has four extraordinarily large hatchways, the three largest of which are 35 ft. long and 30 ft. wide. The holds are absolutely free from all obstructions, such as beams, pillars or webs, and are perfectly self-trimming owing to the sloping sides of the topside tanks. The vessel will carry the unusually large quantity of about 2400 tons of water ballast, of which nearly 1000 tons will be contained in the topside tanks, and can be discharged in twenty minutes without pumping, so that even with water ballast only the vessel will be in excellent trim for maintaining speed, and is capable of going to sea in any weather. A large steel house on shelter deck amidships will contain comfortable staterooms for twelve passengers, also accommodation for captain and officers with chart-room and flying bridge on top. The engineers will be housed at sides of engine casing on shelter deck and the sailors and firemen will be berthed on upper deck aft. The vessel will also have three masts, nine derricks, nine powerful steam winches with a warping winch, steam-steering gear actuated by telemotor, six water-tight bulkheads, and a complete installation of electric light, together with all latest and most modern appliances for the comfort of passengers and rapid handling of cargo. She will be fitted with triple-expansion engines placed aft, by the North-Eastern Marine Engineering Co., Ltd., Sunderland, having cylinders 26 in., 42 in. and 70 in. diameter by 48 in. length of stroke, supplied with steam by three large single-ended boilers working at 180 lbs. pressure and fitted with Howden's system of forced draught. On leaving the ways she was gracefully named the *Konakry* by Mrs. Roxburgh, wife of Mr. W. L. Roxburgh, the owners' resident superintendent. The hull and engines are being constructed under the supervision of Captain W. P. Thompson, the owners' marine superintendent, and Mr. James B. Wilkie, their superintendent engineer.

Sargasso.—On July 30th, there was launched from the shipbuilding yard of Messrs. John Readhead & Sons, West Docks, South Shields, a new screw steamer named the *Sargasso* built to the order of Messrs. Scrutton, Sons & Co., London, for their " direct line." The vessel has been built to Lloyd's highest class on the spar-deck rule, with exceptionally high 'tween decks for the West Indian trade, the arrangements generally, and the facilities for working cargo, etc., having been specially designed to meet the requirements of this particular trade, and special attention has also been paid to the ventilation throughout the ship. A double bottom is fitted for carrying a large quantity of water ballast. The vessel is supplied with eleven steam winches and with eighteen derricks worked from cross trees and tables on the masts, and in addition a heavy derrick capable of lifting twenty tons. Cabins for passengers, captain, etc., are placed in the deck-houses at the fore end of bridge, and accommodation for officers and engineers is provided in a deck-house alongside engine casing ; there is also a house for apprentices, quartermasters, etc., on the poop. A mail and parcel room is fitted up aft, and generally the vessel is exceptionally well equipped. The engines, also constructed by Messrs. John Readhead and Sons, are of the triple-expansion type, having cylinders 26 in., 43 in. and 71 in. with 48 in. stroke, supplied with steam from two large steel boilers fitted with Howden's forced draught, and working at a pressure of 180 lbs. per square inch. The vessel has been built under the superintendence of Mr. H. Barringer, of Messrs. Jacobs & Barringer, London. This is the eighth vessel built for the above firm by Messrs. John Readhead & Sons.

Stigstad.—On July 30th, Messrs. William Gray & Co., Ltd., launched at West Hartlepool the handsome steel screw steamer *Stigstad*, which they have built to the order of Messrs. A. F. Klaveness & Co., Norway. She is built to the highest class in Lloyd's and Norske Veritas and is of the following dimensions :—Length overall, 375 ft. ; breadth, 52 ft. 3 in. ; and depth, 29 ft. 2 in., and is specially designed for the owners' coal and general trade. Superior cabin, captain's and officers' accommodation is provided amidships, the engineers' on the poop while the crew will be berthed in the poop. Eleven extra powerful steam winches are fitted, ten derrick posts, twenty derricks and strong derrick gear, steam-steering gear and hand-screw gear aft, patent direct steam windlass, signal post mast, and a very complete outfit for a first-class cargo steamer. The cellular double bottom extends throughout for water ballast and large after and fore peak ballast tank, while the side tanks have capacity for about 1480 tons additional water ballast, giving over 2870 tons in all. Special pumps, pipes and valves are fitted so that the whole of the ballast can be filled or emptied in five hours. The engines are placed aft and the side tanks (McGlashan's patent) extend from the boiler room to the collision bulkhead, a length of 266 ft. in way of which the ship has double sides which add to her strength and safety. They are specially designed to make the steamer self-trimming the wings being carried in to the hatch side coamings; they are also of special advantage when ore, coal or grain cargoes are carried, presenting

a smooth surface, which is easily cleaned down, and preventing the lodgment of dirt which occurs in ordinary vessels behind stringers and between the frames. The side ballast also improves the speed of vessels running light and considerably reduces the "racing" of the machinery. It is under easy control and saves the cost and delay of shipping sand ballast, which it is often necessary to take on board to ensure a safe passage in ordinary vessels. The machinery consists of a first-class set of triple-expansion engines and boilers capable of developing over 1500 h.p., cylinders 26 in., 42 in. and 70 in., diameter, with a piston stroke of 45 in. and three large main boilers to work at a pressure of 180 lbs. per square inch, all by the Central Marine Engine Works of the builders. The ceremony of christening the steamer *Stigstad* was gracefully performed by Mrs. Andersen, Alfhein per Sandefjord, Norway.

Jamaica.—On August 11th, Messrs. W. Harkess & Son, Ltd., launched from their yard at Middlesbrough a steel screw mail and passenger steamer, which has been built to the order of Messrs. Elder, Dempster & Co., and is intended to run between Jamaica and the neighbouring islands in connection with their Imperial Direct West India Mail service. Her dimensions are 220 ft. by 34 ft. by 16 ft. moulded, she is built to a full specification and Lloyd's highest class and will have a Board of Trade certificate for a large number of passengers. Her engines are being built by Messrs. MacColl and Pollock, Ltd., Sunderland, and are intended to drive her a speed of 11 knots loaded. The vessel will be fitted with a complete electric light installation and with refrigerating machinery for cold storage. On leaving the ways she was named *Jamaica*, the ceremony being performed by Mrs. Henderson, wife of Captain Henderson, of the Elder, Dempster line.

Norburn.—On August 12th, Messrs. Craig, Taylor & Co., Ltd., launched from their Thornaby shipbuilding yard, Thornaby-on-Tees, a handsomely modelled single-deck screw steamer of the following dimensions, *viz.* :—292 ft. by 43 ft. 9 in. by 20 ft. 7 in. moulded. She is built of steel to the highest class in British Corporation Registry, under special survey, and has poop, bridge and topgallant forecastle; water ballast in double bottom fore and aft and in peaks; she is equipped with patent steam windlass with quick-warping ends, steam-steering gear, four steam winches, and Cochran (Annan) donkey boiler with patent seamless furnace, pole masts and all the latest improvements for rapid loading and discharging. The accommodation for captain and officers is neatly fitted up in deck-houses amidships, the engineers being in deck-house alongside engine casing, and the crew in the forecastle. Her engines have been constructed by the Central Marine Engine Works, West Hartlepool, the cylinders being 22 in., 35 in., 58 in. by 39 in., with two large steel boilers working at 160 lbs. pressure. The vessel has been built to the order of W. H. Loveridge, Esq., West Hartlepool, for the Norburn Steam Ship Co., Ltd., (Messrs. Smith, Hogg and Co., West Hartlepool, managers) under the superintendence of Mr. Donald Ross, West Hartlepool. As she left the ways she was gracefully christened the *Norburn* by Mrs. T. G. Smith, wife of one of the managing owners.

Skelwith Force.—On August 12th, the new steel screw steamer *Skelwith Force* was launched from the yard of Messrs. R. Williamson & Son, Workington. The principal dimensions are :—Length, 163 ft. 9 in.; breadth, 26 ft. 6 in.; depth moulded, 13 ft. 2 in., and she is designed to carry 750 tons deadweight on Lloyd's freeboard. The vessel has been built to the highest class at Lloyd's and will be propelled by engines of the triple-expansion type, having cylinders 14 in., 22½ in. and 37 in. diameter, with a stroke of 27 in., steam being supplied by a large cylindrical steel boiler working at a pressure of 160 lbs. The vessel has been built by the above builders to the order of Liverpool owners.

LAUNCHES—Scotch.

Karuah.—On July 29th, Messrs. Ramage & Ferguson, Ltd., Leith, launched a steel twin-screw cargo and passenger steamer built to the order of the Newcastle and Hunter River Steamship Co., Ltd., Sydney, N.S.W., for their coasting trade in New South Wales. The steamer has been built to designs and specifications prepared by the Company's superintendent engineers, Messrs. J. R. Thomson & Son, Sydney, to the highest class of the British Corporation, and has been built under the personal supervision of Mr. J. Sted Thomson. The dimensions are :—Length, 130 ft.; breadth, 27 ft. and depth moulded 8 ft. 6 in., and everything has been provided in the way of steam winches, steam windlass, steam-steering gear, electric light installation, and refrigerating installation to make this vessel one of the most complete vessels of her size for the trade in which she is to be engaged. The propelling machinery consists of two sets of triple-expansion engines having cylinders 9 in., 14½ in. and 24 in. diameter by 18 in. stroke, and steam is supplied from a large Scotch boiler working at 180 lbs. pressure. The vessel is intended to steam at a speed of 10 knots on a very light draught. There is accommodation for twenty-eight passengers in state-rooms on the bridge deck, and these, together with the saloon and other rooms, are all fitted up in a neat and tasteful manner. The steamer on leaving the ways was named *Karuah* by Miss Bryson, 13, Polwarth Grove, Edinburgh.

Elysia.—On August 3rd, Messrs. D. & W. Henderson and Co., Ltd., launched from their shipbuilding yard at Meadowside, a large steel screw steamer for the Indian service of the Anchor Line of the following dimensions :—Length, 440 ft.; breadth, 53 ft.; depth, 32·6 ft. moulded, with a gross tonnage of 6200 tons, and a deadweight capacity of 8600 tons. The vessel, which has been built to the highest class of the British Corporation, will be fitted with triple-expansion engines, the cylinders being 29½ in., 49 in. and 81 in. diameter, with 4 ft. 6 in. stroke, and will have three large double-ended boilers working to a pressure of 180 lbs. There will be ten powerful steam winches, one of them, with warping ends, being placed on the poop for facility in handling the vessel in port. Everything possible has been done to enable the vessel to load and discharge large cargoes with despatch. All holds and 'tween decks are fitted with longitudinal girders supported by four vertical tubular pillars in each compartment. The 'tween decks are unusually lofty, being 10 ft. in height. The petty officers, cooks, and stewards will be accommodated in the topgallant forecastle, which is 48 ft. long, and the crew in the poop, which is also 48 ft. long. The bridge deck extends to 156 ft., under which the engineers are berthed, and the remaining space is available for cargo or coal. The captain and officers will be berthed abaft of the navigating bridge on the boat deck. Superior accommodation has been provided on the bridge and promenade decks for ninety first-class passengers in two and four-berth state-rooms, which are exceptionally large and airy. These are painted enamel white, and are furnished with everything conducive to the comfort of passengers, including electric fans. At the fore-end of bridge deck the saloon is placed, which is a spacious apartment. The woodwork is entirely of polished oak of light shade, with white plaster ceiling. The furniture is also of oak. From the saloon a handsome double stairway leads to the music-room on the fore part of the promenade deck. This room is panelled in mahogany, enamelled white, the panels being decorated with artistic mouldings, and the ceiling covered with plaster of suitable pattern. This room will also be used as the ship's library, and be furnished with the necessary bookcase, also piano and writing tables. On the after part of the promenade deck is the smoking room. This apartment is panelled in polished mahogany. The upholstery work is in moquette, and the ceiling is covered with plaster. From this room there is a special stair leading down to the accommodation on bridge deck. Both music and smoking rooms, in addition to sidelights, have large skylights for light and ventilation. A nursery has been provided, also special accommodation for Ayahs. The vessel is fitted throughout with electric light, including a searchlight for navigating the Suez Canal by night. An insulated chamber for storing meat, vegetables and fruit has been provided, the refrigerating machine being placed in the engine-room. As the vessel left the ways she was named *Elysia* by Miss Julia Henderson, The Castle, Ludlow. The *Elysia* will be despatched from Glasgow and Liverpool on her first voyage to Bombay in September, and will be commanded by Captain Haig, late of the *Circassia*. She is expected to make the passage in twenty-two days.

Kinmount.—On August 3rd, Messrs. Archd. McMillan and Son, Ltd., Dumbarton, launched the steel screw steamer

Kinmount, which they have built for Canadian owners. The *Kinmount* is about 260 ft. in length and is intended for service on the Canadian Lakes. Superior accommodation is provided forward. On top of forecastle there are captain's quarters and large observation room, and under forecastle there is accommodation for the officers and crew, with two spare state-rooms. The engineers are berthed in rooms alongside engine-casing. The machinery, which is fitted aft, is being supplied by Messrs. Muir & Houston, Ltd., Glasgow. The vessel and machinery have been built to the highest class British Corporation, and under the superintendence of Mr. Dunlop, of Messrs. John Reid & Co., naval architects, Glasgow. The naming ceremony was performed by Mrs. John Dunlop, Albert Crescent, Langside, Glasgow.

Oneida.—On August 12th, the Greenock and Grangemouth Dockyard, Co., Ltd., launched from their Grangemouth yard the steel screw oil-tank steamer *Oneida*, which they have built to the order of The Anglo-American Oil Co., Ltd., London. The vessel, which is of the raised quarter-deck type to Lloyd's highest class, will carry about 700 tons on a light draught, her dimensions being :—Length, b.p., 175 ft. ; breadth, 32 ft. 6 in. ; and depth (moulded), 12 ft. 9 in. Engines by Messrs. Richardsons, Westgarth & Co., Ltd., of Middlesbrough, are placed aft, and the holds are sub-divided into eight oil-tight compartments with expansion trunks and hatches. The arrangements for dealing with cargo are of a highly efficient type, including a powerful duplex Hayward-Tyler pump for oil pumping and two steam winches intended for handling oil in barrels. There is a fire-extinguishing and tank steaming-out apparatus, and for the working of the ship a steam-steering gear, steam windlass and steam warping capstan aft. As she is intended to tow barges when necessary, a suitable towing machine has been fitted aft. Accommodation of a superior kind, heated by steam, is arranged on bridge for captain, for officers and for engineers under raised quarter deck and the crew and firemen are berthed in the forecastle. The hull and engines have been superintended during construction by Mr. Graydon Hume. On leaving the ways the vessel was gracefully named by Mrs. Rupert Usmar, wife of the Anglo-American Oil Co.'s manager at Hull. After the launch the company adjourned to the model-room, where a service of cake and wine was partaken of and the usual toasts proposed and responded to. There were present Mr. and Mrs. Rupert Usmar, of Hull, Mr. McLean and Mr. Hume, of the Anglo-American Oil Co., Mr. Millar, Mr. A. Spence Millar, Mr. W. Millar, Mr. Harvey and Mr. Jackson, of the Greenock and Grangemouth Dockyard Co., Captain Colville and Mrs. Colville, of Polmont Park, Mrs. Gair, Falkirk, the Misses Fraser, Falkirk, Mr. Henderson, of Lloyd's, Leith, Mrs. A. Spence Millar, Grangemouth, the Misses Cupples, Grangemouth, and Miss Millar, Greenock.

Jinga.—On August 13th, there was launched from the works of Messrs. Wm. Simons & Co., Ltd., Renfrew, the first of two extremely powerful suction pump and discharging dredgers which this company have on order for the Bombay Port Trust. As the dredger left the launching ways she was gracefully named the *Jinga* by Mrs. A. J. Barry. This dredger which is fitted with what is admittedly the most powerful pumping plant afloat, is designed to dredge 2700 tons of material per hour, and discharge same through a floating pipe line fitted with steel ball and socket joints, and land pipes, to a distance of upwards of 4500 ft. from the side of the dredger. The *Jinga*, with the sister ship, which is in a forward condition, will be employed upon an extensive reclamation scheme at Bombay. Both dredgers have been constructed under the direction of Sir J. Wolfe Barry and Mr. A. J. Barry, M.M.I.C.E., consulting engineers, London, to the Bombay Port Trust, and Mr. George Turner, resident inspecting engineer. It is estimated that by the operations of these two dredgers, under the present scheme alone, an addition of 4½ per cent. will be made to the area of the city of Bombay. The *Jinga* is arranged to proceed to Bombay under its own steam, and for this purpose two sets of compound surface condensing engines are provided, capable of obtaining a speed of 8 knots per hour. The pumping outfit consists of a very large centrifugal suction and discharging pumps directly coupled to triple-expansion surface condensing engines. A large condenser is fitted to take the exhaust steam from all engines on board. Steam is supplied from four very large cylindrical multitubular boilers constructed to Lloyd's full requirements and fitted with Howden's patent forced draught. The boilers are specially designed for burning inferior Indian coal. A very full equipment of engine-room auxiliaries is provided, including independent circulation pumps, independent automatic feed pumps, independent bilge and general service pumps, feed heater, filter, evaporator, etc. A spiral rotary cutter is fitted at lower end of the suction frame driven by steel spur gearing by a set of compound surface condensing engines. The suction frame is controlled by independent steam hoisting gear. Bow and stern winches of particularly powerful construction, arranged for rapid handling of wire rope moorings and anchor cables, are provided. The control of the dredger is centred on the operating bridge, on which is placed all telegraphs, speaking tubes and signals to cutter engines, pump engines and stern winch, also the handles for controlling the frame hoisting gear and the bow winch. One man can thus control and direct all the operations of the dredger and the pipe line. The living accommodation and the general arrangements are all designed for a vessel working in a tropical climate, every attention having been given to light and ventilation. The vessel is electrically lighted throughout, having a powerful searchlight for manipulating the dredger's pipe line when working at night. Telephone communication betwen the dredger and the end of the pipe line is also provided. The *Jinga* was launched complete ready for trials.

Morea.—On August 15th, the *Morea*, the latest and most important addition to the fleet of the Peninsular and Oriental Steam Navigation Co., Ltd., which has been constructed by Barclay, Curle & Co., Ltd., at their Clydeholm Shipyard, near Glasgow, was launched. This fine vessel, one of three recently ordered, represents the latest type of fast mail and passenger steamer for the Peninsular and Oriental Co.'s service to India and Australia ; designed for speed, her fine line and graceful outline suggest a large yacht rather than a vessel of commerce. The leading particulars of the vessel are :—Length, 560 ft. ; breadth, 61 ft. 6 in.; depth, 39 ft.; gross tonnage, 11,500. Quadruple-expansion twin-screw engines, constructed by the builders, will drive the vessel at a speed of 18 knots per hour. Number of first-class passengers, 407 ; number of second-class passengers, 200. The vessel, of which we give a view, has been built under the supervision of the P. & O. Co.'s own staff of inspectors, to the requirements of the Board of Trade for a foreign-going passenger steamship, and under the special survey of the surveyors of Lloyd's Registry. The hull of the vessel generally has been constructed of mild steel, manufactured by the Siemens-Martin open hearth process, the scantlings being considerably in excess of the requirements of Lloyd's. The hull is divided into separate water-tight compartments in order to provide for the safety of the steamer, a complete inner bottom being fitted all fore and aft and numerous water-tight bulkheads dividing the hull transversely. The vessel has four complete decks, *viz.*, orlop, lower, main and upper decks, sheathed with teak and yellow pine. Above the spar deck is, at the fore end, a long forecastle, amidships the hurricane deck, and at the aft end the poop deck. Above the hurricane deck is the first-class promenade deck, extending for 300 ft. amidships, and the second-class promenade deck, 180 ft. long, is situated above the poop deck. Above the midships promenade deck is the boat deck, at the fore end of which are the captain's and officers' rooms, surmounted by a wheelhouse and two flying bridges. In accordance with the usual up-to-date policy of the P. & O. Co., the arrangements for the passenger accommodation have been designed to give the maximum of space and comfort to each individual. The first-class passengers are all berthed amidships, the sleeping cabins being placed on main, spar and hurricane and promenade decks. The now general practice of placing a number of cabins on the promenade deck has been adhered to. The beds are all metallic, with spring mattresses, and lavatories, chests of drawers, writing desks, couches and all the other usual fittings are supplied. The dining saloon—a large and spacious apartment—is situated on the spar deck at the fore end of bridge space and extends the full breadth of the ship ; a feature of this apartment is its great height and the large open well overhead, which extends through three decks to a

[illegible] 29 ft. After the launch the *Rinaldo* was towed to Glasgow, where she will be fitted with machinery by Messrs. D. Rowan and Co

Firth.—[illegible] *Firth*, designed for the coal-carrying trade, was launched by Messrs. Hall, Russell and Co., Aberdeen. The vessel, which has been built to the order of Mr. Andrew Abercromby, Aberdeen, is of the following dimensions:—Length, 160 ft.; breadth, 25 ft.; and depth, 12 ft. 6 in. She has been built under special survey with scantlings in excess of the rules, and will take the highest class in Lloyd's register. She is designed for a high rate of speed when fully laden. Triple-expansion engines and boilers will be fitted by the builders.

Magnet III.—On August 15th, a steam drifter built to the order of Mr. Farquhar, Buckie, was launched from the yard of the John Duthie Torry Shipbuilding Co., Ltd. Dimensions—Length, 94 ft.; beam, 18 ft. 6 in., and depth, 10 ft. The vessel will be engined by James Abernethy & Co., Aberdeen, and was named *Magnet III*.

Otaki.—On August 15th, there was launched at Dumbarton by Messrs. Wm. Denny & Bros. the twin-screw steamer *Otaki*, which they have built to the order of the New Zealand Shipping Co., Ltd., London. The machinery of the vessel consists of a combination of reciprocating engines and turbines. The principle of the experiment is that the steam is first admitted to each of the triple-expansion engines, which drive the twin screws, and then passes to a centre turbine driving the centre screw, before reaching the condenser. In this way fuller advantage is taken of the expansion of the steam. The *Otaki* will be placed on the service between London and New Zealand, being intended for the owners' extensive frozen meat trade. The dimensions of the vessel are:—Length, 464 ft. 6 in.; breadth, 60 ft.; and depth, 34 ft. A feature of her equipment is the refrigerator apparatus, enabling variations of temperature to be obtained, suitable to the various classes of perishable cargo. Although not primarily intended for passenger service, she will take a Board of Trade passenger certificate. The propelling machinery is being supplied by Messrs. Denny & Co., engineers, Dumbarton. At the launch the naming ceremony was performed by Mrs. Warrington Laing, wife of Mr. Warrington Laing, a director of the New Zealand Shipping Co., who was also present.

LAUNCH—Irish.

Leopoldville.—On August 13th, Messrs. Harland & Wolff, Ltd., Belfast, launched the fine steel twin-screw steamer *Leopoldville*, which they are building to the order of the Compagnie Belge Maritime du Congo for the Antwerp-Congo trade. The vessel is 400 ft. long by 53 ft. beam, and about 6500 tons gross, and will have superior accommodation for a large number of first and second-class passengers, the staterooms being large, airy and well appointed, and the public rooms, which include a palm court, superior to anything at present in the trade. The vessel will also have a large deadweight carrying capacity, and the arrangements for working the ship and cargo will be of the most complete kind. The engines will be quadruple-expansion, and the vessel will have electric light throughout.

TRIAL TRIPS.

Ravensbourne.—Lately the *Ravensbourne*, a new survey vessel owned by the Thames Conservancy, successfully underwent her speed and manœuvring trials at Falmouth, attaining her contract speed of 11 knots in spite of not too favourable weather conditions. She was built to Lloyd's 100 A1 Yacht Register Class, and in addition has a Board of Trade passenger certificate. The best of auxiliary steam machinery has been installed and the axiom system of forced lubrication has been fitted to the main engines, which are compound surface condensing, 14 in., and 30 in. by 22 in. with large boiler. Her arrangements permit of work being carried on in dirty weather, the forward saloon being fitted up like a drawing office and communication being provided with both the bridge and men's quarters. The *Ravensbourne* was specially designed by James Pollock, Sons & Co., Ltd., of London, and proved herself a handy little vessel, describing a complete circle in one and a half minutes with either helm, while the engines reverse in a few seconds.

Motor Launch.—Lately a steel-plated motor launch, *Midge* type, built by Mr. Edward Hayes, Stony Stratford, had her trial trip. The vessel's length is 35 ft., beam 6 ft. 6 in., draught about 2 ft. 9 in., and displacement about 5 tons. She is fitted with Fielding four-cylinder motor developing about 40 B.H.P., reversing gear and solid bronze three-bladed propeller of overhung type; her saloon is handsomely fitted up and upholstered in blue, steering b[illegible]h fore and aft; speed on trial averaged about 11 miles. She [illegible]roved an excellent rough water boat and very easily handled

Fameliaris.—On July 29th, the handsome steel screw steamer *Fameliaris* (of which we gave particulars in our July issue, page 490), built by Messrs. W. Gray & Co., Ltd., West Hartlepool, for Mr. Basilies M. B. Fameliaris, Syra, was taken on her trial trip. The trial was carried out satisfactorily, the mean speed of the ship being 10½ knots, and the performance of the ship and machinery all that could be desired. The trial was witnessed on behalf of the owners by Mr. Oslapodopoulos, Mr. C. Gargalos, Supt. Engineer, and Captain G. Monarchidis. The shipbuilders were represented by Captain Murrell, and the engine builders by Mr. Reynard.

Pure Light.—On July 30th, the steel screw oil tank steamer *Pure Light*, built by the Greenock & Grangemouth Dockyard Co., Ltd., at their Greenock yard, to the order of the Pure Oil Co., of Rotterdam and Hamburg, proceeded down the Firth of Clyde on her official speed trials. The principal dimensions of the vessel are:—380 ft. by 51 ft. by 30 ft., and she carries a deadweight of about 7000 tons. She has been built to the highest class of British Lloyd's and Germanischer Lloyd's, and also to the rules of the Hamburg Board of Police. Two powerful pumps are fitted—one set forward and one set aft—so arranged that each can draw from either end of the ship, and circulate water or oil from any given tank. The accommodation for officers is fitted up amidships—a feature being that each officer has a separate room. A complete installation of electric light has been supplied by Messrs. J. H. Holmes & Co., Newcastle-on-Tyne. The machinery for the vessel, consisting of triple-expansion engines 27 in., 42 in. and 73 in. by 48 in. stroke, with three large boilers, has been supplied by Messrs. John G. Kincaid and Co., Clyde Foundry, Greenock, and it may be noted that the machinery in this instance, as in the case of a sister vessel (*Pennoil*), built by the same builders for the same owners some few years ago, is placed amidships, this arrangement, in the case of the duplicate vessel referred to, having proved a complete success. Great care has been exercised in each case to keep up the longitudinal strength of the vessel, as in the case of the *Pennoil*. This steamer has also been fitted with patent circular tunnel, having welded circumferential seams, this type of tunnel having given complete satisfaction in the last case. The tunnel in question is the design of Mr. Millaro, of the shipbuilding firm, and is protected by patent. The weather was fortunately fine, and as the mean of a succession of runs on the measured mile, a speed of 11¼ knots was obtained, this being a quarter of a knot in excess of the guarantee. Immediately thereafter the vessel was set on a six hours' course, when the consumption of coal was found to be well within the limit specified. In replying to the toast of success to the vessel, Mr. J. G. Lamont, general European manager, on behalf of the Pure Oil Company, expressed himself as being thoroughly satisfied with the results obtained on the trial trip, and highly commended the workmanship of the shipbuilders and engineers. The vessel has been superintended by Messrs. Flannery & Gregson, Rotterdam, conjointly with Messrs. Flannery & Given, of Liverpool. It is interesting to learn that the construction of this vessel was only started on the resumption of work after the New Year holidays in January of this year, and has been completed within the contract time. This has rarely occurred in connection with the many vessels ordered within the past eighteen months for this particular trade. The vessel dropped anchor at the Tail-of-the-Bank for the night, and sailed the next day on her first voyage to Philadelphia.

Tamarac.—On August 6th, the new screw steamer *Tamarac*, built by Messrs. Napier & Miller, Old Kilpatrick, for the

Anglo-American Oil Co., ran trials on the Firth of Clyde. The dimensions of the vessel, which is fitted with all the latest appliances for the rapid handling of cargo, are:—Length overall, 400 ft.; breadth, 31 ft. 6 in.; and depth, 30 ft. 3 in. She has been built to Lloyd's highest class for carrying petroleum in bulk. She is fitted with sixteen main tanks and four "summer" or supplementary tanks, and her total carrying capacity is fully 7000 tons. The equipment of the vessel includes safety appliances of the most up-to-date description, such as vacuum and expansion valves, mechanical ventil .ion, etc. In order to reduce the risk of fire a complete nstallation of electric light has been fitted, together with loud speaking telephones and automatic signalling apparatus controlled by electricity. A feature of the vessel's equipment is the manner in which the various tanks are arranged and the complete set of powerful pumps which has been fitted, so that oil may be discharged ashore or in lighters. Different kinds of oils will also be carried at the same time. A powerful towing machine has been fitted aft, as the vessel will also be used to tow oil-barges of as large carrying capacity as the steamer herself. The machinery, which has been supplied by Messrs. D. Rowan & Co., Glasgow, consists of triple-expansion engines, having cylinders 26½ in., 43 in., and 72 in. diameter respectively, and a 51 in. stroke, and also three main boilers and a donkey boiler. An installation of wireless telegraphy is also fitted on board. The progress and full speed trials proved highly satisfactory to both builders and owners. The vessel is commanded by Captain Neil MacDonald.

Milos.—On August 7th, the new steamer *Milos*, built by the Sunderland Shipbuilding Co., Ltd., was taken to sea upon her official loaded trial, the principal dimensions of the vessel are:—Length, 240 ft. by 38 ft. broad by 16 ft. deep, having raised quarter deck, sunk poop, bridge and topgallant forecastle, classed 100 A1 Lloyd's, under special survey. Accommodation is placed on the bridge for officers and engineers, and for seamen and firemen in forecastle as usual. The saloon is in a deckhouse at the fore end of bridge, and is tastefully fitted up with berths for captain and officers. Cochran (Annan) donkey boiler with patent seamless furnace has been supplied for working the deck machinery, which consists of five steam winches, steam steering gear and direct steam windlass. The machinery has been supplied by the North-Eastern Marine Engineering Co., Ltd., Sunderland, and has cylinders 17½ in., 28 in., and 48 in. by 33 in. stroke, with one large boiler. The vessel has been built to the order of N. C. Corfitzon, Esq., of Helsingborg, through August Bank, Esq., Sunderland. During construction both hull and machinery have been inspected by Mr. H. A. Hands, of Newcastle and Sunderland The trial was in every way satisfactory, and a speed of 10 knots was obtained.

Sir Walter Scott.—On August 7th, the screw steamer *Sir Walter Scott* (of which we gave particulars in our August issue, page 27), built by The Blyth Shipbuilding and Dry Docks Co., Ltd., for Messrs. The Scott Steam Shipping Co., Ltd. (Messrs. John O. Scott & Co., Newcastle-on-Tyne, managers), was taken to sea for trial. Triple-expansion engines of good power have been fitted by Messrs. North-Eastern Marine Engineering Co., Ltd., Sunderland, cylinders 19 in., 31 in. and 51 in. by 36 in. stroke, one boiler 17 ft. by 11 ft. working at 180 lbs. pressure. The steamer was run several times over the measured mile, the representatives of owners, builders and engineers on board being highly satisfied with the performance of both ship and machinery, good results being obtained.

Orcoma.—On August 8th, the new steamer *Orcoma* (of which we gave particulars in our May issue, page 419), built by Messrs. William Beardmore & Co., Ltd., Dalmuir, for the Pacific Steam Navigation Co., arrived at Liverpool from the Clyde. On August 7th she made a preliminary trip on the Firth of Clyde and on the trip to the Mersey she maintained the satisfactory average speed of 17½ knots. The Pacific Steam Navigation Company were represented on the trip by Mr. James G. Nicholson, deputy chairman; Mr. Frederick Alcock, F.R.G.S., general manager; Mr. James Thompson, consulting engineer; Mr. H. Ballantyne, superintendent engineer, and Captain Drummond, marine superintendent. The *Orcoma* was billed to sail on August 27th on her maiden voyage to the West Coast of South America, under the command of Captain W. H. Hayes.

Redbreast.—On August 12th, the new steamer *Redbreast*, built by Messrs. A. & J. Inglis, Ltd., Pointhouse, for the Scotch and Irish passenger and mail service of Messrs. G. and J. Burns, Ltd., ran trials on the Clyde, and on the stretch between the Cloch and the Cumbrae Lighthouses attained a speed of 16 knots. The dimensions of the steamer are as follows:—Length, 277 ft.; breadth, 33 ft. 6 in.; and depth, moulded), 16 ft. 8 in. The *Redbreast* has been built under, special survey to Board of Trade and Lloyd's requirements, and is classed 100 A1 Lloyd's Registry. She has been constructed on the most modern lines for passenger, cargo and cattle service. There is a large dining saloon for first-class passengers on the poop deck, while the first-class state-rooms and ladies' cabins are situated on the main and lower decks, and are tastefully upholstered and fitted with all the latest improvements. A feature of the sleeping accommodation is the large number of state-rooms which have been provided to accommodate one person only.

Brika.—On August 18th, the large steel screw steamer *Brika* (of which we gave particulars in our July issue, page 491), built by Messrs. R. Craggs & Sons, Ltd., Tees Dockyard, Middlesbrough, for the English and American Shipping Co. (managers, Messrs. C. T. Bowring & Co., Ltd., London), proceeded to sea for her official trials. The results were pronounced satisfactory to all concerned, the vessel registering an average speed of 11 knots over the measured mile under difficult conditions.

Kildin.—On August 18th, the steel screw steamer *Kildin* (of which we gave particulars in our July issue, page 491), built by Messrs. William Dobson & Co., Shipbuilders, Walker, for the Archangel-Mourman Steam Navigation Co., of Archangel, was taken to sea for her official trial trip. After the trial the vessel proceeded on her maiden voyage to Archangel.

Mourilyan.—On August 20th, the new twin-screw steamer *Mourilyan* (of which we gave particulars in our July issue, page 491), built by Messrs. Alex. Stephen & Sons, Ltd., Linthouse, for the Howard Smith Co., Ltd., Melbourne, ran trials on the Firth of Clyde. The *Mourilyan* went down the Firth as far as Pladda, going inside Holy Island on the downward run, and along the Ayrshire coast on the upward stretch. The trials proved satisfactory in every respect, the contract speed being exceeded by over half a knot.

Internal Combustion Engines.—H.M.S. *Rattler*, the gunboat propelled by suction gas engines, fitted by Messrs. Beardmore, which was on trials about twelve months ago, has been engaged under command of the Marquis of Graham during the month of August in making cruises with parties of the Royal Naval Volunteer Reserve. The Volunteers are exercised in service drill during the cruises, which have been made under conditions favourable to training as well as to pleasurable associations. Messrs. Beardmore and Co. have devoted a great deal of attention to the development of internal combustion engines and have recently taken up the manufacture of the "Peck" engine, the motive power of which is derived from paraffin.

BOARD OF TRADE EXAMINATIONS.

Note—1C denotes First Class; 2C Second Class.

June 27th, 1908

Adams, Wm. H.	2C	Liverpool
Anderson, J. M.	1C	Greenock
Barrass, Samuel	2C	N Shields
Bateman, H. C.	1C	London
Bisset, Robert	1C	Aberdeen
Davidson, John	2C	Aberdeen
De Jong, John..	1C	London
Edwards, Thos.	1C	Bristol
Erskine, John C.	1C	Sunderl'd
Hall, James....	2C	N.Shields
Hendry, John..	1C	Greenock
Heron, Georde	2C	Greenock
Hunter, Wm...	1C	Greenock
Jones, Sydney	1C	Sunderl'd
Jones, John M.	2C	Liverpool
Langley, F. O.	2C	London
Macdonald, C.F.	1C	Aberdeen
Mallet, John J.	2C	N.Shields
Meikle, Norman	2C	Liverpool
M'Intosh, Peter	1C	N Shields
Myers, Leonard	2C	Hull
Piper, Richard	1C	N.Shields
Radford, S. P.	2C	Liverpool
Ramsey, J. B.	2C	Liverpool
Rish, L. D. ..	2C	Liverpool
Ryan, John F.	2C	London
Savage, H.M'D	2C	London
Scott, Garnet E	2C	London
Scott, William	1C	Sunderl'd
Shier, David ..	1C	London
Sim, John ..	1C	Aberdeen
Smith, James ..	1C	Greenock
Stevenson, Robt	1C	Liverpool
Still, Hugh M'A	2C	Aberdeen
Street, B. H. ..	1C	Hull
Swanney, Thos	2C	N.Shields
Thom, Alex.	1C	Aberdeen
Thomas, W. E.	1C	Bristol
Thomson, J. L.	2C	Greenock
Wadmon, A. E.	2C	Bristol
Young, John ..	2C	London

The Marine Engineer
And Naval Architect.
LONDON, OCTOBER 1, 1908.

CORROSION AND DECAY OF METALS

THE lecture delivered by Mr. J. T. Milton in the Congress Hall, Franco-British Exhibition, to the Institute of Marine Engineers, embraced a subject of great importance and intense interest to all who deal with metals. Corrosion and decay are terms which may be applied to all things visible. It is one of the functions of science to trace the causes which contribute to waste and decay; it is another to discover a process to arrest or lessen them—to find an antidote. The wastages which occur in the boiler compartments are greater as a rule than those which take place elsewhere in a steamer, and are more pronounced in the case of steel than iron framework. The alternations of heat and cold, aggravated by moisture, are elements which tend to intensify the corrosive action; but since the more general introduction of water-ballast tanks and the experience of the abnormal corrosion in sections under the boilers, especially in cases where these were placed close to the tank top, engineers have been more alive to the conditions to be avoided, as well as the best means to adopt for the preservation of the plating and framework. Periodic scaling and coating with a good proved composition are the best preservatives, while, obviously, it is a preventative of abnormal wastage under the boilers to keep these well above the tank top and floors and provide ventilation to the tanks; it is probably a better arrangement still, if such can be dispensed with, to have no water ballast below the boilers. The abnormal experiences met with of cast-iron chests and chambers, where the metal becomes soft and may be pared with a knife, the pitting and holing of pipes and condenser tubes, the breaking away of brass pump rods in pieces, the pitting and wasting of boiler plates, the corrosive action on the backs of propeller blades, are all well known to engineers, and in the discussion which is to take place on the subject matter of the lecture no doubt many valuable points will be raised and light thrown on these for the general good. The presence of rust scale and of what is termed mill scale on plates is no doubt detrimental to them, and should be removed, whether on the boiler or on the framework of a ship.

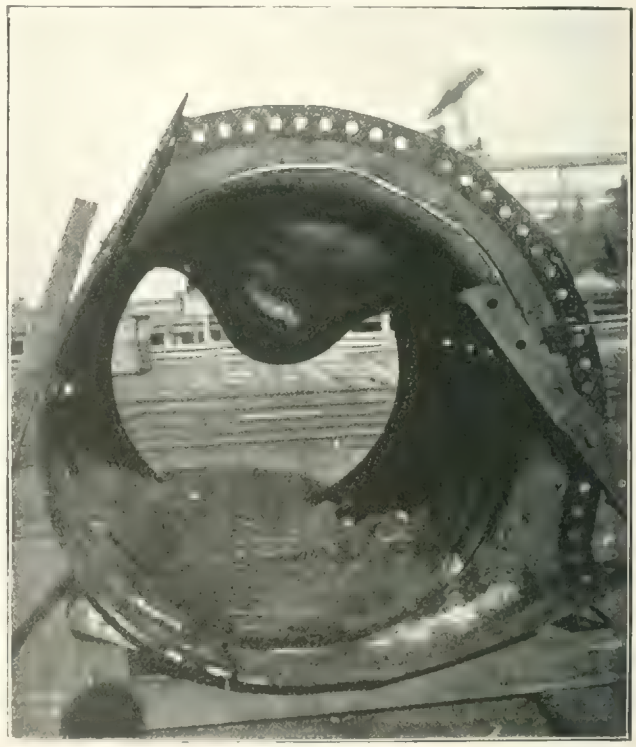
ACCIDENTS.

IT is a trite saying that more is learnt from failures than from successes, and this is well exemplified by the facts set out in the annual report for the year 1907 of Mr. Michael Longridge, the Chief Engineer to the British Engine, Boiler and Electrical Insurance Company, Ltd. It is always interesting to read reports of this gentleman, as the facts are tersely set out and the conclusions, so far as they can be given, succinctly stated; and although the subject-matter is highly technical, humour is not entirely absent. Further, in cases where no assignable reason can be given for disaster there is frank admission of inability to solve the problem. It is interesting to note that since the Company began to issue certificates of safety for boilers twenty-six years ago the Chief Engineer has been able to announce year by year that no life has yet been lost by the explosion of any certified boiler. However, 1907 has spoilt such a fine record, owing to the fact that a man was killed by the fracture of the internal angle iron ring securing the bottom end plate of a vertical chimney boiler to the shell. This accident was brought about by the development of a fine crack at the bottom of the grooving which could not be seen; and although the boiler had been thoroughly examined year by year by one of the Company's inspectors, and by the Chief Engineer at the works, no one discovered the grooving, although it was looked for, and under all the circumstances this accident appeared to be more the Company's misfortune rather than its fault. In examining the returns of the various classes of breakdown in steam and other engines, one notices a marked increase during the past year of breakdown of valves and valve gearings, while spur gearing shows considerable reduction. It would appear that the increase in the number of breakdowns of steam engines traceable to failure of valve gears is probably the result of increase in speeds and the number of parts, while the reduction in the number of breakages from spur gearing is the natural consequence of the substitution of rope and direct driving for the older system of transmission. The report shows that the steady increase in broken cylinders and pistons is due principally to the use of steam at temperatures and pressures higher than the parts can safely bear. The subject of the breaking of the number of main shafts, as presented by the report, is most interesting, as the marked reduction shown is remarkable and, as admitted by Mr. Longridge, inexplicable. Among breakdowns described in the report, reference may be made to one or two as being of special interest. A horizontal compound engine, having cylinders 26¼ in. and 40¼ in. diameter by 4 ft. 6 in. stroke, running at 40 revolutions per minute, with a boiler pressure of 80 lbs. per square inch, one day began to gain speed, and the engineer immediately shut the stop valve. The speed diminished before the engine was actually stopped, the bed-plate on the low-pressure side broke with a loud report and the crank pedestal was forced forward ½ in. The piston was subsequently found driven about $\frac{1}{16}$ in. up the cone on the rod, the cotter in it bent, and the crank pin loosened in the

crank. The increase of speed was due to the set screw in the governor gear becoming loose and the governor losing control, and the damage was caused by water entering the cylinder from the condenser, the driver having forgotten to shut off the injection or to destroy the vacuum in the cylinder by opening the drain cocks. Had the engine been fitted with an automatic knock-off gear and vacuum breaker such a result would not have occurred. Another example is that of a high-speed inverted triple-expansion engine, running at 383 revolutions per minute, with cylinders 14 in., $20\frac{1}{2}$ in., and 30 in. diameter by 14 in. stroke, direct coupled to a dynamo. The exhaust steam from the condensing cylinder was led through a valve in the exhaust pipe to a jet condenser, or alternatively, when this valve was closed, through an automatic atmospheric valve to the atmosphere. The condenser was cleared by a pair of Edwards' air pumps, driven by an electric motor, receiving current from the dynamo driven by the engine. It drew its own water from a pond, whose surface was about 15 ft. 7 in. below the middle of the cylinders. Thus, in the event of the air pumps ceasing to clear the condenser, the water from the pond would be forced into the low-pressure cylinder if the pressure in it were more than 6·7 lbs. per square inch below that of the atmosphere upon the surface of the pond. The usual practice in shutting down was to close first the engine stop valve, and then the valve in the exhaust pipe to shut off the condenser. On the evening of the breakdown this practice was adhered to, but the engine, instead of coming gradually to a standstill, as usual, stopped suddenly as the driver was about to close the valve in the exhaust pipe. The cause of the sudden stoppage was an inrush of water from the condenser into the low-pressure cylinder, which bent the piston and stretched the bolts in both ends of the connecting rod. It is commonly believed that some special guardian protects children and drunken men. Surely that guardian must have drawn this engine also under the covering of its wings, otherwise it could hardly have escaped disaster during the twelve months it had run. Every day there must have been a race between the water and the man. Would the water reach the cylinder or the man the valve in the exhaust pipe first? It must have been hard to obtain odds from anyone "in the know." No, the least reflection would have shown the driver that the valve he closed first was precisely the valve he should have closed last. If he had destroyed the vacuum, either by closing the injection cock or by shutting off the condenser, or by opening the atmospheric valve before touching the engine stop valve, the accident would not have happened. Accidents such as these would point out that a very narrow margin of safety exists when the human factor becomes an important agent in controlling the transmission of energy, and how necessary it is to provide means for neutralizing the result of any omission on the part of the man in charge, and thus avoid serious accidents which involve loss of time and money, and in some cases of human life.

COLLAPSED FURNACE.

THE accompanying illustration is reproduced from the photograph of a collapsed furnace which was removed from the boiler of a steamer at Newport News. The history of the boiler and the circumstances under which the disaster occurred are not sufficiently known to give an extended description, but the illustration is in itself sufficient to be of considerable interest. It is well known among engineers



Collapsed Furnace.

trading in the neighbourhood of the Mexican coast that there is at least one district where it is undesirable to get water for the boilers on account of the scale-forming properties with which it is charged. We have been informed of cases where trouble has been experienced due to this water, as well as of other cases where trouble has been averted by coincident circumstances giving warning.

INSTITUTE OF MARINE ENGINEERS. The annual dinner of this Institute has been arranged to take place in the King's Hall, Holborn Restaurant, Holborn, W.C., on Wednesday, October 28th. The Office Bearers and Council are desirous of giving a very hearty welcome to the president, and hope for the support of every member on this occasion.

NEW SHIP AND ENGINE REPAIRING WORKS OF THE CLYDE TRUST.

On the occasion of the annual inspection by the Clyde Trustees of the harbour and river, with special reference to the works of extension and reconstruction proceeding at various parts, which took place on September 1st, the most important matters of interest coming before the visitors were the new basins and quayage at Yorkhill, which are now more than three-fourths constructed, and the new establishment at Renfrew for the repair of the floating plant and maintenance of the mechanical appliances of the docks and harbour. These latter works, which supersede for such purposes the former establishment at Dalmuir—the site of which now forms a portion of Messrs. Beardmore's extensive shipbuilding works there—have been built and equipped on the most modern principles; and the heavy repairs incidental to the extensive floating and other plant possessed by the trustees will be overtaken with an expedition and economy not possible at the Dalmuir works. The site has an area of about 9¼ acres. The river front, 565 ft. in length, was recessed 80 ft. so as to widen the river to that extent. On this frontage is a wharf supplied with a 25-ton electric crane and in west front there is another wharf. Three slips have been constructed—one for hauling up hopper barges and dredgers, and two smaller for punts and steam ferry boats. The first-named or large slip is a great improvement on the Dalmuir one, the carriage being hauled up the incline by two wire ropes, connected to an electrically-driven winch, in one-fifth of the time required by the old system with hydraulic rams and rods. The winch, which was made by Messrs. William Simons & Co., Renfrew, is of very massive design with double heaving barrels for the two haulage wire ropes, which are 9½ inch in circumference, the barrels being grooved throughout their width to take the full length of rope without over-riding. The winch is operated by a three-phase slip-ring motor of 200 B.H.P. through worm and spur gearing to the main barrels and is capable of hauling up at a speed of 10 ft. per minute, also starting from rest and lowering a vessel of 1200 tons maximum weight, the incline of the slip being 1 in 18. Each of the barrels is operated by coil clutches and a separate barrel and wire rope purchase is provided for hauling down the empty cradle. The cradle has been specially designed for dealing with the Trustees' hopper barges and consists of two side carriages which allow of the hopper doors being lowered for examination and repair. The cradles on the two smaller slipways are also operated by a three-phase slip-ring motor, and there is substantial housing at the head of slipways for the punts, ferries, etc., while under repair.

Instead of the different trades being housed in separate buildings they are all accommodated in two extensive well-lighted shops in open bays. The larger of these is 340 ft. by 140 ft., and contains working sections for boilermakers, engineers, smiths and stores. The other main building, which is 150 ft. by 120 ft., contains working sections for sawyers, joiners, pattern-makers, boat-builders and carpenters. On page 72 are views of the engineering and boilermaking sections respectively. From these it will be gathered that the shops are plentifully equipped with the most approved machinery and appliances—all by British makers of well-known repute.

The driving power throughout is electrical, three-phase current of 25 periods per second being supplied by the Clyde Valley Electrical Power Company, the voltage being 400. The current is used as supplied for driving the various shaftings, winches, fans, etc., and a motor generator of 75 K.W. output is installed for generating direct current for arc lighting and working the crane motors. Squirrel-cage motors are fitted for driving the line shafting in engine shop, boiler shop and sawmill. No special starting device is fitted otherwise than the usual auto-transformer, but the difficulty has been got over by the use of Hyatt roller bearings which reduce the starting torque very considerably.

Electric overhead travelling cranes by Royce, Ltd., are provided for serving in the several sections, one 15-ton crane in the engine shop, one 10-ton in boiler shop, and one 3-ton in main stores. All these cranes are of large span (80 ft.), and the girders are heavily braced to give rigidity for quick travelling. A 3-ton overhead electric crane of 50 ft. span is fitted in the sawmill section for dealing with heavy timber.

Throughout the works and open spaces there are eighty 10-ampère Crompton arc lamps, thirty-two of which are in the open on lofty poles. There is a complete absence of overhead wiring, etc., the current being conducted through lead-covered insulated cables laid underground in pitch troughs on the solid principle. The connections in the works and the means of transport throughout are matters thoroughly ample and sufficient, a locomotive derrick crane by Booth Bros., capable of lifting two tons at a radius of 34 ft., serving on the ordinary gauge railways throughout the open yard. A 2 ft. 6 in. gauge railway traverses the floors of the various workshops.

The number of workmen employed on the average will be 180, and the conditions under which they will be employed as to cleanliness, order and sanitary convenience are in every respect up-to-date. The dining hall, capable of seating 150 workmen, with cooking and pantry departments annexed, is a feature in the establishment, as is also a commodious lavatory with lock-up closets and wash-hand basins with hot and cold water laid on.

BOILER EXPLOSION ON THE STEAMER "PAHUD."

In our August issue we reproduced a photograph showing the result of a boiler explosion which took place on board the *Pahud* at Sumatra. We have since received two further photographs, one of

S.S. *Pahud* after the explosion at the Wharf Belawan.

Damage done to Wharf and Shed by boiler explosion of S S *Pahud*

which shows the steamer alongside the wharf and the other shows details of the damage done.

THE FLEETS OF THE MAIL LINES.

(From our Own Correspondent.)

The New White Star Steamers.

NO less than four steamships of considerable interest are either building for this company in the yard of Messrs. Harland & Wolff or will shortly be laid down by that firm in the Queen's Island Yard. The vessels are in two pairs, the first of which will be the *Laurentic*, of which I spoke in last month's notes, and the *Megantic*. The former of these sisters was launched on the 10th September. She will be the biggest ship in the Canadian trade, having a gross register of no less than 14,500 tons. She will have a good deal of passenger as well as large cargo accommodation. The relative provision for second-class and saloon passengers is perhaps noticeable. In the New York trade it is usual for the numbers in the first cabin to be nearly double those in the intermediate section. But in the *Laurentic* the proportions will be reversed, state-rooms for 430 second-class and for but 230 saloon passengers being provided. The ship will, of course, have a Marconi installation and will also have receivers for the receipt of submarine bell signals. This is the ship which is to have the mixed installation of turbine and reciprocating engines. Her sister, the *Megantic*, on the other hand, will have reciprocating engines only, and the comparative performance of the two vessels will be watched no doubt with all the interest with which the steaming of the Cunarders *Caronia* and *Carmania* was followed.

We are also informed that the company's gigantic vessels for the New York trade are actually under construction. The preparations for their building have occupied Messrs. Sir William Arrol & Co. for many months, and at last the keels of the two giants are laid. Their names are already decided on. The first will be named the *Olympic* and the second *Titanic*. These are good and appropriate names for important vessels, and are of great and pleasant contrast to some of the manufactured and distorted names which have of recent years been given to ships of the White Star fleet. How the vessels are to be propelled is as yet undisclosed, and possibly it will not be decided till the results of the *Laurentic's* working have been recorded and discussed. But apparently the vessels will be of about 40,000 tons register and of a speed approximating that of the *Oceanic* rather than that of the *Adriatic* class of liner.

The Newhaven Route.

I have crossed once or twice lately to Dieppe, and have been much struck by the efficient service which is maintained by the Brighton steamers, whilst the boat train too is well coached and good in every respect. But there are one or two points in which the comfort of passengers might be served on the French side, whilst at the same time greater punctuality of arrival in Paris might be effected. The harbour at Dieppe is—as most of my readers know—at once tortuous and narrow. The vessels bound for Newhaven are supposed, according to schedule, to leave before the arrival of the steamer from England. But in practice, of course, they do not always do so. There may be a rush of west-bound passengers or delay to the Paris train. The rule having been adopted that the inward boat shall not be admitted till the outward boat has got clear of the harbour, it is maintained by the French harbour master with Spartan rigidity—no circumstances seeming to justify a departure from it. One night when I crossed from Newhaven there was a big excursion to London and no less than three steamers were starting for England. The bulk of their passengers had come from Paris and naturally the trains were delayed. When we got off the harbour at a few minutes past two the lights signalled us to wait; and wait we did for rather over two hours, till the third of the three outward-bound steamers had got away. It would have been perfectly easy to have admitted us and got our steamer comfortably berthed at her quay before the first of the trio was ready to cast loose. But it would have been against precedent, and so it was not permissible. I heard of another case where the inward steamer was kept waiting an unconscionable time because the train from Paris had broken down. If a fresh engine had to be got from Rouen to complete the journey there is no reason why the hapless passengers of the incoming boat should ever have been landed, their delay being due to an accident which should never have affected them at all.

Another point which the French authorities could easily remedy is the method of dealing with the baggage. When the Paris train is unloading, the luggage vans may be, and often are, a great distance away from the steamer, being placed at the far ends of a long train. Instead of dealing with the packages wholesale, as they are at Dover and Calais—where arrangements generally are by no means perfect—they are dealt with piecemeal, being carried long distances either in tiny trucks or on men's shoulders one by one. If the Calais plan cannot be adopted time would surely be saved by shunting the vans to positions nearer the gangways. It is obviously no use running steamers and trains at high speed if time be wasted in transhipment, and one may be sure that punctuality in arrival and departure is far more appreciated by old travellers than a short paper transit, which is in practice not always obtained.

The Winans Cigar Ship.

In hunting over some old notes the other day I came across an account of the famous cigar ship which, built in 1864, till within the last few years was a noticeable object in Southampton Water. She was literally of cigar shape, her length being some 256 ft. overall, whilst her greatest diameter was but 16 ft. Her displacement was about 500 tons, and she was constructed of steel and Low Moor iron, her plates below the water line being $\frac{5}{8}$ in. and above $\frac{5}{16}$ in. in thickness. Her strength was attained by the fact that she had thirteen transverse bulkheads, whilst she had no stringers, though in the engine and boiler-rooms there were internal rings of angle iron 7 in. deep and spaced at intervals of 3 ft. These rings were bolted to her skin. In lieu of the ordinary keel she had a band of iron, 1 in. thick and 3 ft. wide, attached to the lower side of her plating. The upper deck was 130 ft. long by 10 ft. 6 in. wide, and internally there was an iron deck some 6 ft. above the bottom plates; this was intended to serve as a passenger deck. The designed speed was some 26 knots and it was to be attained by the use of a single set of engines having three cylinders. This drove a shaft which ran the full length of the ship. At each end of the vessel there was an eight-bladed screw of 22 ft. diameter. As the taper of the vessel was considered an essential part of the design, and as the thickness of the shafting and the bearing would have interfered with its symmetry, when the ends began to get very fine, some 16 ft. of the hull itself was actually attached to the shafting at each end, and was made to revolve with it. There were two rudders fitted to the craft, one at each end of the vessel. They were placed beneath the propellors. The estimated horsepower was about 2500 i.h.p.—a vast power for the day in which she was built. Steam to drive the engines was supplied at 150 lbs. pressure by four boilers of the locomotive type—also at that time a new departure for marine engineering practice. They had some 136 sq. ft. of fire bars amongst them. The vessel was built on the Thames from the designs of Mr. Hepworth.

The White Star Line and the Combine.

There has been talk of an intention on the part of the managers of the International Mercantile Marine Co. to eventually put their whole fleet under the White Star flag. This suggestion has, of course, been met with a prompt denial and, in point of fact, it is not likely to be true. Nevertheless, the White Star element does, and must, assert its predominance. New tonnage of the passenger class seems a better asset if it bears a White Star name than that of any other of the associated companies. This we see in the case of the new steamers building for the Dominion St. Lawrence service—they are to be White Star liners. And whilst the White Star Co. is extending, other of the associates are dying out. It should not be forgotten that the old National Steamship Company, which, at one time, maintained a weekly service for cargo and passengers between Liverpool and New York, as well as running a line from the Thames across the Atlantic, is still in being. It exists as ancillary to the Atlantic Transport Co., a useful limb of Mr. Morgan's organization. The shareholders of the National have always strenuously opposed any suggestion of dissolution. But efflux of time seems to

be settling the question for them. The fleet had been reduced to four vessels, two twin and two single screws. Of the former class were the *Manhattan*, built for the Company since its association with the Atlantic Transport Co., and the *Michigan*, acquired during the same period, whilst of the latter were the *Europe* and the *America*, built in 1891, for the old management, by Messrs. Gourlay's, of Dundee. These two ships were some time ago taken over by the managing partner and renamed. One of them, which, since its absorption in the actual Atlantic Transport Fleet, has been known as the *Memphis*, is now sold to shipbreakers, and so ends her career.

The good management of the machinery department of Atlantic mail steamers has once more been evinced by the fact that in this month of September, 1908, the White Star *Oceanic*—a vessel nine years old—has just achieved the fastest passage she has yet made, running from Queenstown to Sandy Hook in five days, sixteen hours and twenty-five minutes.

Whilst mentioning this Company, it may be well to place on record the fact that the cargo service between Liverpool and New York, discontinued some two months ago, is now about to be resumed. For many years, of course, it was a regular weekly despatch, though the resumed service will not at present make its sailings with anything like such frequency. But the fact that it is resumed at all is a good sign and one that it may be hoped indicates returning prosperity to the Atlantic cargo trade.

The Hamburg-Amerika Line

has now practically captured the direction of the German Levant Line. The affairs of the latter company had been somewhat disastrous of late, and a re-organization was necessary. One of the points insisted upon in the rearrangement was that a director of the larger and more prosperous concern should be given a seat on the Board, and thus that effective co-operation between the two Companies should be secured.

To show the low ebb to which the Levant Line's affairs had fallen, it may be mentioned that in their last annual report, they announced a loss of upwards of 2,800,000 marks and suggested that it would be necessary to write off some three millions of marks from the capital. At the same time certain existing arrangements with other German companies were terminated.

In the account of the new liner *Spreewald*, built for the Hamburg-Amerika line's West India service, it is noticed that a device has been fitted whereby in thick weather it is possible to blow the syren automatically at any desired intervals. Such a device—which is, of course, worked electrically—not only tends to save labour, and to relieve the attention of those charged with the navigation of the ship for less mechanical duties at a time when all their faculties must be alert, but it also secures greater regularity in the interval between the blasts than would be practically obtainable when hand blowing is practised.

Railway Ferries.

Whilst on that important route between Dover and Calais the arrangements for embarking and disembarking passengers still remain open to vast improvement, and the ferry scheme still hangs in the wind, thanks chiefly to the attitude of the British Railway Company, the railway ferry system is being pushed forward persistently enough in other countries. The latest crossing to be attacked is that between Sassnitz and Trelleborg, where a distance of no less than sixty-five miles of open sea has to be negotiated. But the German and Swedish Governments have recognised the importance of the connection and have arranged to carry it out. Four ferry steamers, each capable of carrying eight or ten railway coaches, are to be put on the station as a commencement. The experience which has been acquired from the long working of such ferries in American and Continental waters has been taken advantage of to the full and the design of the vessels makes in every way for the safety and comfort of passengers and for expeditious and economical handling of the trains. As one of the four steamers is to be built in a British yard, opportunity may be afforded to some of our readers to see something of a modern example of this type of ship.

The specialization of design in shipbuilding to the particular work in which the vessel is to be engaged becomes more marked as time goes on. In the old sailing ship days, variations in size and rig seem to have been all that were thought of. Now ships are so specially adapted for one trade that they are practically useless for any other. One of the latest developments of extreme specialization has been seen in the steamer *Transporter*, built by Messrs. Vickers, Sons & Maxim, for the conveyance of submarine boats to Japan. She is able to take two such vessels, her machinery being placed aft and the whole of the forward portion being available for their stowage. She loads them in a novel fashion as she is sunk in dry dock. The water being then admitted, the submarines are afterwards floated into position. Then the dock is pumped dry, the ship made secure and subsequently undocked and sent to sea.

An Old Steamer.

I was interested to read of the stranding of the paddle steamer *Magnus*, near Gibraltar, a short while back. This steamer is some forty-four years old and was, till her accident, still at work. She was engaged when she first came out in the exciting work of blockade running during the later stages of the American Civil War. The stranding which she now suffered, though at first considered serious, has by no means proved fatal to her and it has been reported that her injuries are being patched.

Two steamers have recently been overdue in the Pacific. The first was the *Hawea*, of the Union Company of New Zealand. She, however, came safely through her ordeal, having merely been disabled and obliged to wait till something sighted her and towed her into port. Her good luck seemed to re-assure people about the fate of the other ship—the *Aeon* of Melbourne—a comparatively new ship (she was built at Newcastle as recently as the year 1905), of some 4,221 tons gross register, which left San Francisco for Sydney on the 6th July. About the middle of the month of August she made her appearance in the overdue market, and by mid-September had got to a rate of about sixty guineas, when the news came that she was cast away on Christmas Island. A boat sent to communicate the news made the long voyage to Fanning Island, the station of the Pacific cable, in safety on the morning of the 18th September.

Multiple Steamers.

I have received a copy of an illustrated pamphlet entitled "The Ocean Express of the Future." The author, Mr. James Dickie, calls attention to the methods by which high speeds are sought at the present moment. Whatever the type of vessel—unless, indeed, she be an obsolete paddler—the power is applied at the stern, with the result that that portion of the vessel tends to bury itself, whilst the bows are lifted more and more out of the water. Thus it comes that the entrance which the naval architect designed for the ship never gets a real chance of aiding her, sets of lines totally different from those contemplated for the duty being exposed to the pressure of the water against which she is being forced. Mr. Dickie's suggestion would be to make the passenger steamer of the future a great platform standing on three—or even possibly more—hulls placed parallel to one another. Instead of hurling herself against solid masses of water and having to push them on one side, the ship so constructed would glide swiftly through the water without much disturbance, the displaced mass being able to drift through the channel provided between the hulls. It would be possible, in Mr. Dickie's view, with a steamer of this class to distribute the position of the propellors and thus to still further augment the power of the vessel. The idea thus put forward is not surely altogether a novel one, for the underlying suggestion was embodied in the twin ships of the *Castalia* type of vessels, which were tried in the Channel route and found unsuitable for the requirement of the trade for which they were designed, as long ago as the seventies of the nineteenth century.

MESSRS. CONRAD, LAUER & CO. inform us that they have started business as boiler and steam pipe coverers at 65, Euston Road, London. N.W.

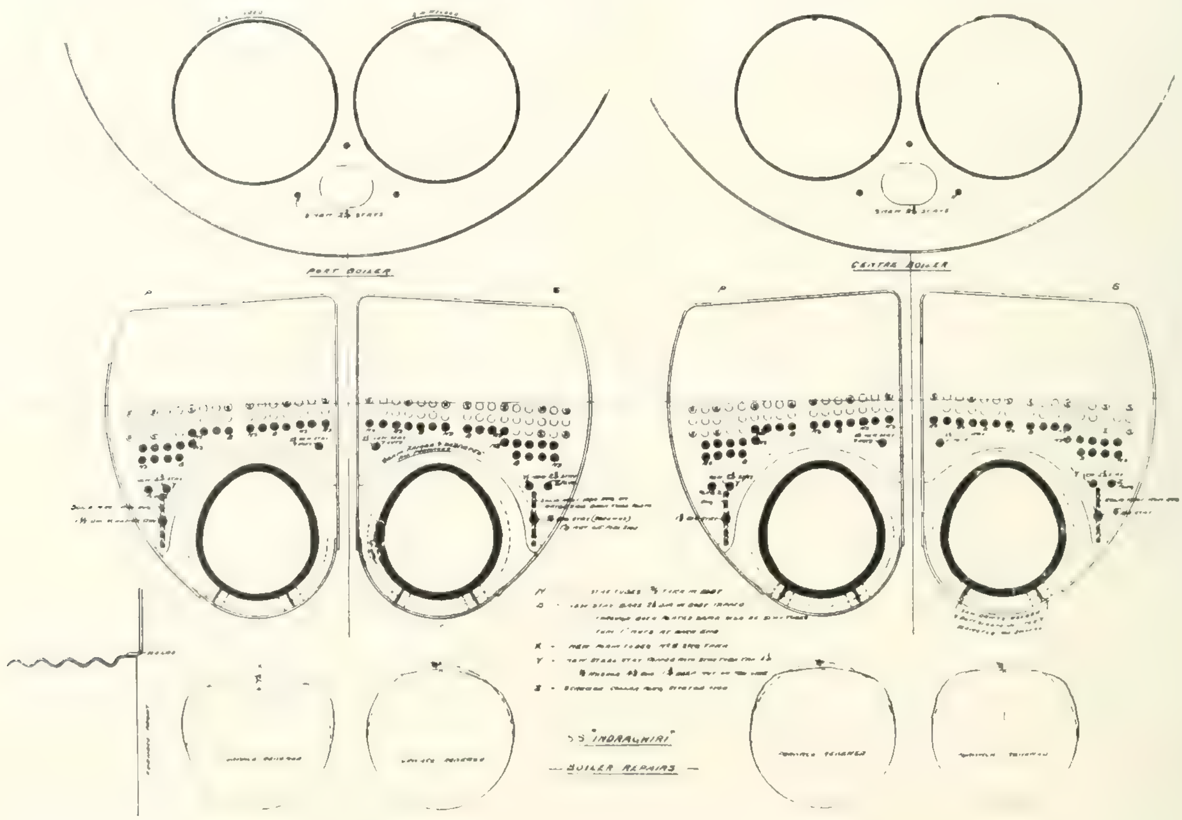
INSTITUTION OF ENGINEERS AND SHIPBUILDERS IN SCOTLAND.—The official address of this institution is 3, Elmbank Crescent, Glasgow, until the 16th November, 1908, when the new premises at 39, Elmbank Crescent (directly opposite 3, Elmbank Crescent) will be ready for occupation.

OXY-ACETYLENE WELDING PROCESS

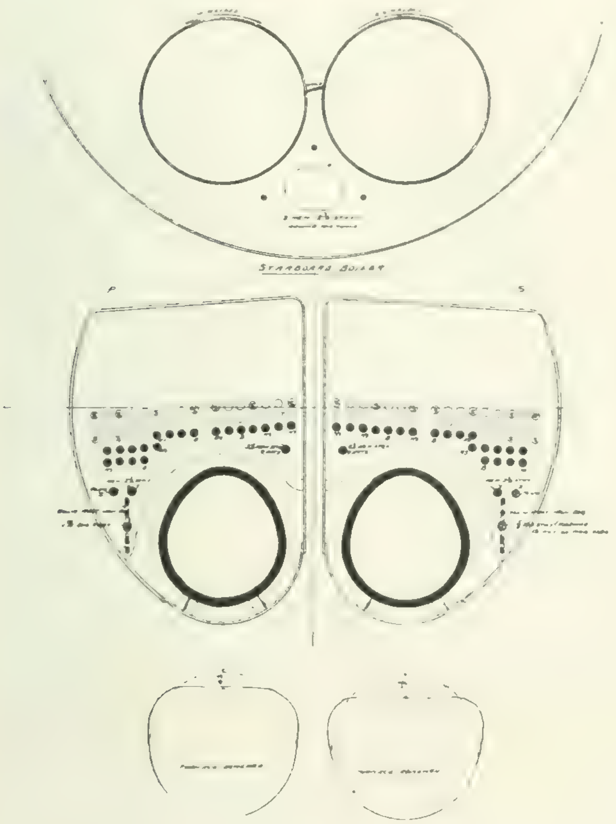
A VERY interesting series of repairs were carried out on the boilers of the s.s. *Indraghiri*, in the Victoria Dock, London, during September, which appeal to us as well worthy of notice and illustration, as the repairs in question evidence the progress which is being made in the use of the oxy-acetylene process for cutting out, welding and building up thicknesses on corroded or wasted plates. It had been found necessary to remove the furnaces from the boilers of the *Indraghiri* and fit a new set, on account of depressions and other defects. In ordinary circumstances the furnaces would have required to be cropped and ripped out by hand—a long and laborious process—in order to save disturbing the shell and tube plates. The oxy-acetylene plant was, however, brought into service, and in a very short time the furnace tubes were separated into pieces by the intense heat of the jet of flame kept acting along the line it was desired to rip them, the rivets cut out and the divided furnace plates removed. In order to adapt the fronts and back-ends to receive the new furnaces—which were of the most modern style with the bottle-neck at the firebox end—the front tube plate was pieced and built up to the necessary thickness where defective by grooving action at the top of the furnace mouth and flanged to suit the outside diameter. The lower part of the firebox plating was altered and flanged to suit the flange of the furnace. The rest of the work was done in the usual way by the boilermakers employed by Messrs. R. & H. Green, Blackwall, to whom the repairs were entrusted. The time taken to effect the repairs was less than would be required by the ordinary course, and certainly much less work was involved in cutting away. Several firms have invested in the plant necessary to carry out the work by the oxy-acetylene process, and it is as remarkable to witness the operation as to find it quite reliable in its results. The welding of iron pipes and tubes and the building up of wasted places to the original thickness are repairs which are carried out frequently by the process. The oxygen is supplied from the usual oxygen cylinder at high pressure to the orifice at the nozzle of the burner, where it joins with the acetylene supplied from a drum. The flame which plays upon the metal is clean and very intense, and the building-up material is obtained from a small bar or wire of Swedish or Lowmoor iron melted into the defective places or the edges of the weld until the required amount is made up.

The defective edge of the original structure is brought to a welding heat by the flame, a small portion of the wire is then brought to the same heat and amalgamates, the whole becoming homogeneous, and so the building-up process goes on until the desired thickness is obtained.

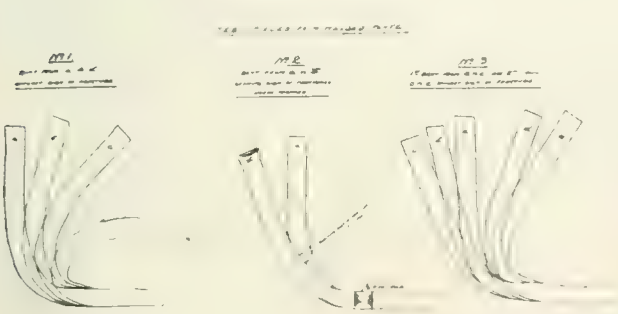
The rate at which the cutting through of a $\frac{5}{8}$-inch steel plate is performed by the fusing flame is about 10 inches per minute. During the process it is



necessary for the operator to wear preservative glasses to protect the eyes from the intense light. Beyond the necessity involved in the use of the glasses there are no other disadvantages in connection with the process, and the training of men for the manipulation



of the materials is not a lengthy one, while the facilities which are being offered to firms to train experts are such that no doubt most of the repairing firms will adopt the necessary plant. After the repairs were carried out on the boilers of the *Indraghiri*, the



usual hydraulic pressure test was applied, when the results were found satisfactory to the representatives who had supervised the work. The steam pressure on the boilers is 200 lbs.

The illustrations show the depressions in the furnaces, also the work done by the oxy-acetylene process, and test pieces from welded plates.

PARAGRAPHS.

Institute of Marine Engineers.—The Lloyd's Register Scholarship, value £50, tenable for two years, has been gained in competitive examination by Mr. James Richmond Thomson, of Clydebank. The Scholarship is intended to provide an opportunity for young engineers to follow up a technical course at the day classes in addition to what they have been able to take at evening classes during their apprenticeship. The examinations are held at various centres annually, the subjects of examination being algebra (including quadratics), elements of statics, dynamics, thermodynamics, and hydrostatics; Euclid, books I., II., III. and IV.; general knowledge; English grammar and composition; language, French or German; plane trigonometry, including logarithms; practical engineering and workshop practice. Candidates must be Graduates or Associates of the Institute of Marine Engineers, and particulars of the necessary qualifications for these grades of membership may be obtained on application to the Hon. Secretary (James Adamson, Esq.), 58, Romford Road, Stratford, London, E.

The World of To-Day.—The countries of the world are better known to the average reader, in a general way, to-day than they were a generation ago; there are also now many opportunities afforded in technical libraries which can be taken advantage of by students, or those who desire to see into the heart of things and revel amid statistics. To those, however, who desire to obtain concise information at hand and have beside them a readable book for consultation, "The World of To-day" can be commended. Statistics are shown by graphic diagrams, illustrating comparatively the work accomplished by the leading nations in output of material of various kinds, including agricultural produce. The shipbuilding returns of the leading ports and countries, revenues, exports and imports, tonnage and similar details of information are tabulated in a handy form for reference.

Paisley, famed during a century or more for its shawls and more recently for its thread, is a place within whose burgh can be seen much to interest the visitor who has time to spare to wander around. The old Abbey, whose original structure, dating back to 1163, was destroyed by fire in the troublous times of 1307, and afterwards rebuilt of considerable size, then added to, and renovated in 1790, and yet more recently thoroughly overhauled and cleaned. The large church, built by the Messrs. Coates, as a memorial to the founder of the firm, is one of the most striking of the modern buildings and is a very fine edifice. The shades of Tannahill, the Wilsons and many others known to fame, archbishops, theologians of no mean order, are as memories treasured in the minds of the citizens, and their haunts can be pointed out by those who are interested in folk lore. The site of the Roman settlement of Vanduara is now little more than a name, modern encroachments having almost obliterated the ancient landmarks to which we owe so much all over the kingdom, but in the old records the settlement is described and traces can yet be identified amid the buildings and changes of more recent times. On the banks of the river Cart, which at low water is a very small stream, there are shipbuilding yards where vessels of fairly large tonnage have been built in the reach near where the Cart flows into the Clyde. Higher up the river, nearer the Abbey, is the yard attached to the Abercorn Works of Messrs. Hanna, Donald and Wilson, with a frontage to the river of about 250 ft., which admits of launching vessels of 200 ft. broadside on. The launches, tugs, yachts and torpedo boats which have been built by the firm have done good work, but the general depression prevails here as elsewhere and the yard is at present empty. The erecting and tool workshops partake of the complaint, dearth of work, the jobs which are on hand being nearly completed and little to look forward to. Some of the excellent work executed at the Abercorn Works we have seen in action, and when the sun of awakened trade breaks forth we trust that the rays will shine upon an enlarged prosperity, with ample orders in execution, here as elsewhere.

Boiler Shop, Clyde Trust Repair Works, Renfrew.

(For Description see page 67.)

Machine Shop from North end, Clyde Trust Repair Works, Renfrew.

NAVAL MATTERS—PAST AND PROSPECTIVE.

(From our Own Correspondents.)

Portsmouth Dockyard.

THE launch of the battleship *St. Vincent* took place on September 10th in the presence of nearly ten thousand spectators and in beautiful weather. Lady Beauchamp christened the vessel in the orthodox manner and then completed the launch by severing with mallet and chisel the cords. The ship at once glided down the ways to the playing of "Rule Britannia" and hearty cheers. Afterwards her ladyship was presented with a water-colour drawing of the vessel as she will appear when completed, and also with a casket containing the mallet and chisel. The *St. Vincent*, which is the third of the type to be built at this yard, is the heaviest vessel ever launched at Portsmouth. She was laid down on Dcember 30th by Mrs. C. G. Robinson, the wife of the Admiral-Superintendent, that lady being one of those present when the ship took the water. It has been arranged that our other vessel of the "Dreadnought" type, the *Bellerophon*, is to commence her steam and gunnery trials on October 26th, and they are expected to extend over six weeks. The cruiser *Berwick*, of the local division of the Home Fleet, was paid off at the beginning of the month to undergo an extensive refit, which will take until the beginning of November. She is the first vessel since the introduction of the nucleus crew system to pay off for such a purpose, these ships having hitherto remained in commission while in dockyard hands. A great deal was made in some quarters of a collision between the battleship *Russell* and the cruiser *Venus* while the ships of the Atlantic Fleet were lying in the St. Lawrence off Quebec, during the visit of the Prince of Wales to Canada. A slight collision did take place, it is true, the battleship damaging one of the cruiser's 6-in. guns. On the return of the fleet the *Venus* put in here and changed the gun, but nothing was done to the vessel herself. Owing to the continued stormy weather and rough sea at the beginning of the month the salvage operations on the *Gladiator* were considerably hindered. The vessel was raised to an almost upright position on September 8th, and it appears nearly certain that she will be brought here by the time these lines are in print. The question then arises, is the game worth the candle? An interesting ceremony took place on board the *Good Hope* before Rear-Admiral Sir Percy Scott took her to South Africa as the flagship of his Special Service Squadron. The occasion was the presentation of the two cups which the cruiser had won in competiton with all the ships of the Channel Fleet for shooting. This is the second year in succession that the *Good Hope* has proved the best shooting ship in the Channel Fleet, which is probably a record in the Navy. There are indications that Messrs. Morrison and Mason, the contractors for the new lock, will shortly make a start, some of the plant having already arrived. Needless to say, it has brought a large number of labourers to the dockyard gates in the hope of getting a job. A deputation recently waited upon the Admiralty with reference to the Spithead Breakwater, and work has now been suspended while the petition is under consideration. There seems a possibility that the original proposal will be somewhat modified. It was represented that it would be dangerous, for instance, to try to get a sailing barge through an opening a hundred feet wide, and a wider opening near the shore was asked for. It is anticipated that the request will be acceded to. The fishermen frequenting Spithead recently reported to the King's Harbourmaster that an obstruction on the bottom was fouling their nets, and a search with sweeps and divers was therefore made. The obstruction proved to be an old anchor dating back to the year 1800, which was brought to the surface, having only the ring and part of the shank missing. Doubtless it will find its way into a museum in the course of time. It is not often that an admiral happens to be one of a lifeboat crew. Such, however, was the case during the gale at the beginning of the month, when Rear-Admiral Startin, who succeeds Rear-Admiral Foley in the Channel Fleet on October 1st, went in the Hayling Island lifeboat to a schooner in distress six miles from shore. Admiral Startin is just the kind of man to do such a thing. He has on four occasions been decorated by the Royal Humane Society for going overboard to the rescue of shipmates, and would without doubt have been again decorated had the circumstances been reported at the time. A change has taken place on the engineering staff of the Commander-in-Chief of this port, Engineer Rear-Admiral J. M. C. Bennett having succeeded Engineer Rear-Admiral G. A. Haddy. The results of the May science examinations of the Board of Education are very satisfactory as far as the Dockyard School is concerned. Of seven Royal exhibitions and five national scholarships (in Mechanics) offered annually for competition throughout the kingdom, Portsmouth apprentices have carried off eight, thus only leaving four for other parts of the country.

Chatham Dockyard.

The old rumours have been going round that the Admiralty have decided to lay down a cruiser at Chatham, but there appears to be no foundation for the story. It is indeed strange who sets such statements afloat. It is also stated that an attempt will shortly be made to dock the battleship *Dreadnought*, in view of the successful docking of the armoured cruiser *Indomitable*, which came here after her return from Canada with the Prince of Wales. The only difficulty—a most important one—would appear to be as regards the width of the entrance to the dock, which is 84 ft. The *Indomitable* has 78½ feet beam, while the *Dreadnought* has 82 feet. Thus there would be only two feet to spare, which would be running it too close to be pleasant. What will probably happen will be that the *Dreadnought* will go into the steam basin to have defects made good and afterwards proceed to Portsmouth to be docked. Two battleships of the Channel Fleet are paying us a visit. The *Triumph* is undergoing an overhaul and the *Dominion* is having her magazines fitted with cooling apparutas. When the latter vessel was here for her annual refit the work was commenced, but she had to leave before the job was completed. She is expected to be out of hand by the end of the first week of October, so as to join the fleet for its autumn cruise. The *Dominion* is becoming quite a familiar ship at Chatham, this being her third appearance in about eighteen months. The cruiser *Minerva* has arrived from the Mediterranean for the purpose of paying off and recommissioning. She is not expected to remain long. The battleship *Bulwark*, which was commissioned here to take the place of the *Formidable* in the Channel Fleet, has had her defects made good and has left to take up her new duties. We shall not probably see her here again, as she is now a Devonport ship for manning and refitting purposes. In her place we have been given the *Duncan*, of the Atlantic Fleet, which was commissioned at Portsmouth by the old crew of the *Bulwark*. Other vessels to pay off and recommission have been the *Albermarle*, which recently returned from Quebec, and the *Victorious*. The former vessel is now the flagship of Rear-Admiral Fisher, who has succeeded Sir John Jellicoe as Rear-Admiral in the Atlantic Fleet. The *Victorious* is to remain in the Nore Division of the Home Fleet pending the delivery of the new ships. The cruiser *Endymion*, the gunnery ship at Sheerness, is in dockyard hands, for the purpose of being mounted with 4-in. guns instead of the 4·7-in. quick-firing guns which she previously carried. This is in consequence of the adoption of 4-in. breech-loaders as the secondary armament of new battleships. Other work in hand includes the *Earnest*, of the Eastern Group of Destroyers, which came in from Harwich on September 14th for a refit. The work of reblading the turbines of Torpedo Boat No. 9 is a most interesting job, and all are very keen that it should be carried out successfully, it being the first work of the kind we have had. There are several officers and men in this yard accustomed to the repair of turbines, for soon after they were introduced into the service a number of men were sent to the works of the makers to familiarize themselves with the turbines, and since then lectures have been delivered here, the knowledge thus imparted having been found of great assistance. The *Ganges II.* has arrived from Harwich for conversion into a coal hulk for service at Sheerness. The vessel will be dismantled and her guns removed in readiness for fitting her for her new duties. The *Agincourt*, as the vessel was first named, began her active service career at Sheerness over forty years ago, as flagship of the Commander-in-Chief at the Nore. Another

of our old vessels, reminiscent of the ancient glories of Chatham, is to be sold out of the service—the battleship *Alexandra*. She was built and equipped here at a cost of £650,000 and christened by the Queen. The vessel, which hoisted the pennant for her maiden commission thirty-two years ago, has for the past three years been lying in the East Kyle of Bute with other obsolete ships. It is satisfactory to know that Lieutenant Groves, whose efforts resulted in saving the lives of the crew of submarine A9 recently off Dover, and who has since been very ill at the Royal Naval Hospital here, has recovered sufficiently to be sent to his home. The accident to the submarine had the peculiar effect on Lieutenant Groves and one of the crew of causing them to lose their memories. Admiral of the Fleet Sir John Fisher showed great interest in the young officer, and called at the hospital twice to see him.

Devonport Dockyard.

Preparations for launching the *Collingwood* on the first Saturday in November are under way, but at the time of writing nothing is known as to the lady who is to be invited to name the vessel. It is stated in some quarters that their Lordships have decided to ask a lady who is a direct descendant of the famous admiral after whom the vessel is to be named. If so, it would be a most happy idea. The commissioning of her sister ship the *Téméraire* will be considerably delayed by the engineers' strike. The battleship *Commonwealth* has rejoined the Channel Fleet, being the first vessel to be fitted with the new high-power wireless apparatus. It is intended to instal the new fittings in all other large vessels as they come into dockyard hands. The *New Zealand*, which is undergoing a refit, will be so installed, and the *Hibernia* also of the Channel Fleet, came in on September 19th and exchanged her low-power set for a high-power set. The vessel, however, only remained here three days. The cruiser *Highflyer* has returned from the East Indies station, having been relieved by the *Fox*. She is to have her equipment brought thoroughly up-to-date, in addition to any repairs she may need. The cruiser *Roxburgh* is also in hand for a refit. The destroyer *Kennet*, of the Channel Fleet, is in dock. While the flotilla was lying in Torbay on the night of August 19th she snapped her cable and drove down on the *Arun*. The *Kennet* was injured on the port side above water near the engine-room. In addition to having this put right she is to be installed with a set of wireless apparatus of the improved destroyer type. Some of the vessels of our local destroyer flotilla have been on a cruise to Scottish waters. The *Vixen*, while leaving Troon Harbour on September 8th, ran into Lord Ailsa's steam yacht *Parole*, which was lying at anchor, and struck her near the stern, the yacht being almost cut in two and sinking in about half an hour. The destroyer was practically uninjured. Torpedo Boats Nos. 104 and 108 were taken in hand on September 11th for repairs to damage sustained through being in collision in the Channel. The vessels appear to have hit one another, when almost parallel, with a glancing blow, each sustaining damage to several plates, whilst the deck of No. 104 was injured somewhat. The damage to Torpedo Boat No. 86 has been put right. As I stated last month, she grounded near Fort Bovisand, but her injuries were not at all serious. The refit of the destroyer *Fairy* has also been completed. There has just been delivered to the Channel Fleet base at Portland a specially fitted hospital launch, which has been adapted from the regular 42-ft. service launch. It was fitted by Messrs. Rogers, of Cremyl. The accommodation provided is for eleven cot cases, with additional room for less serious cases if required. Rear-Admiral Cross, the Admiral-Superintendent who recently presented the prizes to the boys of the *Mount Edgcumbe*, the training ship of the Committee of Devon and Cornwall, incidentally referred to the stress of industrial competition. He said that at Devonport there were from 800 to 1000 men and boys who were vainly trying to get work in the yard. An interesting presentation took place recently at the offices of the French Consul, when Lieutenant Fletcher, recently chief officer of Coastguard at Kilkee, was presented by Sir Joseph Bellamy, the French Consul, with a gold medal and a pair of binoculars on behalf of the French Government. In October last, on the occasion of the wreck of the French barque *Leon XIII.*, Lieutenant Fletcher was in charge of the life-saving apparatus, and he remained on the exposed beach for over fifty hours, twenty-two of the crew being saved. Then in March last he rendered valuable help to the French vessel *Ernest Reyner*. A medal was also presented to Mrs. Fletcher for her humane conduct and kindness to the shipwrecked mariners. Chief Boatswain Furneaux, who has just died at Plymouth at an advanced age, was instructor in seamanship on board the cadet training ship *Britannia* at Dartmouth, and taught the late Duke of Clarence and the Prince of Wales, the young Princes on leaving the vessel presenting him with a gold watch and chain. The Prince of Wales did not forget his old instructor, for on hearing of his death His Royal Highness sent a letter to Mr. Furneaux's son expressing his sincere regret and sympathy. The letter was forwarded by the Prince's equerry, Captain Sir Charles Cust, who, curiously enough, was on board the *Britannia* at the same time.

Sheerness Dockyard.

The vessels of the Nore Division of the Home Fleet have been during the past month carrying out their battle practice at Cromarty. Three targets were towed round to Moray Firth at the beginning of September, the battleship *Victorious*, the repair ship *Cyclops* and the special service vessel *Hearty* each taking one. The weather was very rough and the *Hearty's* target broke adrift in the North Sea, but was luckily recovered. We have such a stress of work that it has been found necessary to send some away. The destroyer *Waveney*, which has been sent round to Portsmouth for her refit, has defects which will keep her in dock for a longer period than we can spare a dock here, and as she has a Portsmouth crew she has been sent there for repair. Four other boats of the Eastern Group of destroyers have also come in—the *Tartar*, *Mohawk*, *Ure* and *Cossack*, the latter to have the supports of her gun platforms strengthened. The *Tartar* and *Mohawk*, which have furnace defects, are to be ready to resume their duties on September 28th. The gunboat *Thrush*, having had the damage received in collision repaired, left on September 3rd to resume coasting and fishery duties in the North Sea. Submarine C6 has had her refit completed, and has rejoined the Nore flotilla, C8 taking her place in dockyard hands. The flotilla left Harwich at the end of August on an exercise cruise in the North Sea. The parent ship, the cruiser *Thames*, accompanied the flotilla on the cruise, which lasted until September 10th, Lowestoft and Grimsby being made the head-quarters during the exercises. Engineer Rear-Admiral R. J. Tench, who was recently succeeded on the staff of the Commander-in-Chief at the Nore by Engineer Rear-Admiral R. B. Priston, has now retired after over thirty-six years' service. Sixteen years ago he had a most unpleasant experience when assistant to the chief engineer of Devonport Dockyard. He was on board the *Phœbe* when that vessel was undergoing her steam trials. When making forced draught the boiler tubes sprang a leak, flames burst out from the furnaces in consequence of a back draught, and Mr. Tench and two stokers were injured. The coolness and ready action displayed on the occasion by Staff-Engineer Tench, as he was at the time, was brought to the notice of the Admiralty, who wrote a letter expressing their appreciation. The officer who has been promoted to Engineer Rear-Admiral to fill the vacancy is Engineer-Captain J. E. Chase, who has been latterly on the staff of Vice-Admiral Sir Assheton Curzon-Howe, the Commander-in-Chief of the Atlantic Fleet. He was the assistant engineer of the *Volage* during the transit of Venus Expedition to Kerguelen Island in 1874-5.

Pembroke Dockyard.

The Lords of the Admiralty paid us a visit at the beginning of the month and inspected the workshops and the ships under construction. Mr. McKenna, the First Lord, accompanied by his wife, was on board the Admiralty yacht *Enchantress*, which remained here from September 8th to 10th. The First Lord is making himself thoroughly acquainted with the naval establishments, for he has just concluded a tour which commenced at Rosyth and extended south and west. The right honourable gentleman has probably been gathering material for his lecture on the British Navy, which he is to give at Glasgow a day or two before the anniversary of Trafalgar. We shall shortly be having some additional work. In a letter received from the Admiralty in reply to representations as to the urgency of providing more work for the yard, their Lordships state that the gunboat *Halcyon* and the coastguard tender *Thrush* will be sent here early in December and the tender *Fanny* at

the end of that month for their annual [illegible]. Other [illegible] work will also be provided, if necessary, so as to avoid a discharge of hands. Although the extent of the work will be inconsiderable, it will be very welcome and we hope it will come. It must be remembered that their Lordships have not fulfilled the promises made earlier in the year, when it was stated that destroyers were to be sent here to be reboilered and refitted, and probably vessels would also be sent to be fitted out for mine layers. Only one destroyer has arrived up to the present—the *Greyhound*—and the mine layers are conspicuous by their absence. The *Greyhound* was undocked on September 2nd and taken alongside the *Boadicea* at the Carr Jetty; the *Medusa* being docked a couple of days later. The [illegible] was docked on September 16th to be prepared for her steam trials, which will "if possible," take place in November. The refit of the *Greyhound* is well advanced, but the machinery defects will probably take until well into November. At the time of writing the *Defence* had not returned from her trials, which had been delayed somewhat in consequence of defects in the electrical equipment. Her thirty-hours' steam trial on August 28th at one-fifth of her power was highly satisfactory, despite the fact that very rough weather was met with in the Channel. The trials were resumed at Devonport on September 7th. The second thirty-hours' steam trial took place on the 18th and the full-power trial on the 23rd. The adaptation of the cruiser *Medusa* for calibration purposes at Bantry is proceeding satisfactorily. The main part of her fittings have been removed and she is to be fitted with long topmasts, probably for wireless purposes, while her electrical system is to be rearranged. It is stated that eleven of the fourteen camels for service at Dover Harbour are to be built at Chatham instead of at this yard, owing to the difficulty in towing them round. It seems strange that the difficulty was not foreseen, for we have sufficient timber here to build six or seven of the camels, which weigh about 150 tons each. Two old Pembroke ships which have done good service are in the shipbreakers' hands—the old Royal yacht *Osborne*, built here in 1870, and the old battleship *Dreadnought*, built some five years later. Shall we ever build such large vessels here again? The late Mr. Frederick Barnes, whose death at the age of ninety recently occurred at Llandrindod Wells, was one of Pembroke's most distinguished ex-apprentices. During his college career he achieved distinction and at its conclusion was appointed constructive officer at the Admiralty, being employed with the designing staff. In 1864 he became assistant to Mr. (afterwards Sir Edward) Reed, the then chief constructor. Mr. Barnes was appointed surveyor of dockyards in 1872, retaining that post until his retirement in 1886. The present method of calculating the stability of ships is attributed to him, and is therefore generally spoken of as "Barnes' method." Decorations were not plentiful in his day, or doubtless Mr. Barnes might have been rewarded with a knighthood.

Solidified Lamp Oil.—The high price of colza oil has led to a mixture of other oils to form a lamp oil of a marketable price for engine-room lamps, with the result that an abnormal amount of smoke is given off to offend the nostrils and the paint work, with the added expense consequent upon the distress caused both to the human element and the surface coating of the engine-room. The periodical examination and the cleaning of boilers may be done by means of the portable electric light, which is clean and healthy, but it is not always convenient to have the light on, and recourse is had to the open engine-room lamp with its smoke-giving flame and an unhealthy atmosphere in a confined space is produced. Cocoanut oil is not only a good, but a wholesome illuminant. It, however, becomes less the slave of the lamp in Western than in Eastern waters; it is more suitable beyond the Suez Canal than the Mediterranean side of it, at all events except during hot summer weather. Wax has been in use for many years for engine-room lamps in some lines of steamers, and of late solidified lamp oil has been tried with satisfactory results; it is less costly than the ordinary lamp, or "improved colza," oil and gives off less smoke, two elements which ought to commend it to the marine engineer, whose efforts are more than ever directed to economize for the benefit of the shipowner.

THE WORLD'S BIGGEST BATTLESHIPS.

The "St. Vincent" and "Minas Geraes."

The 10th of September is likely to remain a unique date in shipbuilding circles, as upon that day the two biggest battleships in the world, H.M.S. *St. Vincent* and the Brazilian *Minas Geraes* were launched at Portsmouth and Elswick respectively. Until recently the general characteristics of each ship were surrounded in mystery, the *Minas Geraes* especially. The construction of a number of 13·5-inch guns in this country founded a rumour that each of the three ships building for the Brazilian Government would carry four of these monster weapons, supplemented by ten 10-inch guns. For a long time this armament was generally regarded as correct, until the true details of the ships came to light and a model of the *Minas Geraes* was exhibited at the Franco-British Engineering Section, by the builders.

The following table gives the particulars of each ship:—

	St. Vincent.	*Minas Geraes.*
Displacement..	19,250	19,000.
Length	[illegible]	[illegible]
Beam	[illegible]	[illegible]
Draught	[illegible]	[illegible]
Armament	[illegible] in. guns	[illegible] inch.
	20 4-in. guns	22 4·7-inch.
Protection	11 in.—4 in. belt	9 in.—4 in.
	$2\frac{3}{4}$ in. deck	$2\frac{1}{4}$ in.
	8 in.—6 in. upper belt ..	9 in.—6 in.
	12 in.—8 in. big gun positions	9 in.
Machinery	Turbine	Reciprocating
I.H.P.	24,500	24,500.
Boilers	Babcock	Babcock.
Screws........	4......................	2.
Speed	21	21.

It will be seen that, excepting in the dispositions of the guns, the ships resemble each other to a remarkable extent. The actual displacement of each will probably be more like 21,000 tons, but while the *St. Vincent's* speed is expected to exceed 23 knots, owing to the improvements recently introduced into turbine machinery, the *Minas Geraes* will not greatly improve on her designed figures. As may be seen from our illustrations, the ships represent the two main types of design, which may be classed as "British" and "American." The *St. Vincent* follows the *Dreadnought* lines very closely, the only outward difference being that the former has two big tripod masts and some slight protection for her 4-in. guns, instead of a baby tripod mast between the after turrets and exposed 3-in. guns in her superstructure. The Brazilian ship follows the model of the American *Michigan* (which ship we recently dealt with), inasmuch as her second and third turrets are in the centre line and raised to fire over the roofs of the fore and aftermast. In the *St. Vincent*, the amidships guns are on the same cross section; the *Minas Geraes*, however, has her starboard pair forward of the mast and the port abaft it—the back of the one gun-house being exactly in a straight line with the face of the other. This arrangement was made necessary owing to the magazine dispositions, and not because—as has been suggested—the guns were originally intended to have a cross-deck bearing like the *Invincible*, with something of a similar superstructure.

In the absence of official data relative to the effect of overhead gun-fire, it is difficult to form any definite conclusions as to the disadvantages or advantages of the American system of gun positions. The earlier experiments in the French navy when some sheep were placed in the after 10-in. turret on the *Henri Quatre* and the 5·5-in. gun behind and above it fired dead astern, proved that the concussion was sufficient to partially—or even completely—stun a man. Then, again, in the first designs for the Swedish cruiser *Fylgia*, raised overhead firing guns were proposed, but abandoned as unsatisfactory, and a more "Dreadnought"-like arrangement substituted. The whole question, therefore, turns upon the following queries:—Has an alteration in relative positions of the gun-muzzle and turret-top made it possible for the effect of the blast to be minimised? or, is the fire of the raised guns along the keel-line going to be dispensed with until the sub-turret is out of action? As regards the first,

it will be noticed that the muzzles of the raised guns on the *Minas Geraes* and *Michigan* project well over the sighting hoods of the lower turrets, so that the blast is expended in front of the gunners below, and not directly behind them, as a reliable source that these injurious effects have been overcome, and that a system of overhead firing will be introduced into the *Foudroyant*—or whatever the new battleship to be built at Portsmouth is called—in spite of the mistrust the

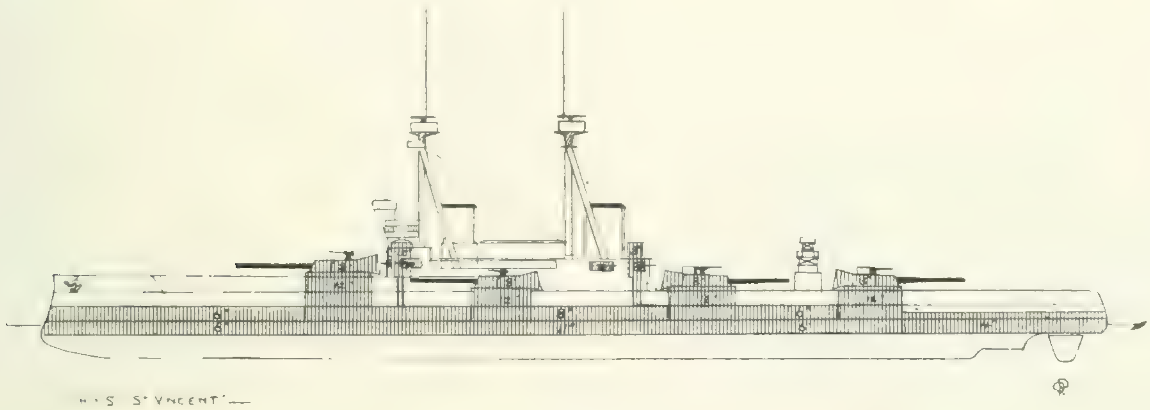
H.M.S. "St. Vincent."

Brazilian Battleship, "Minas Geraes."

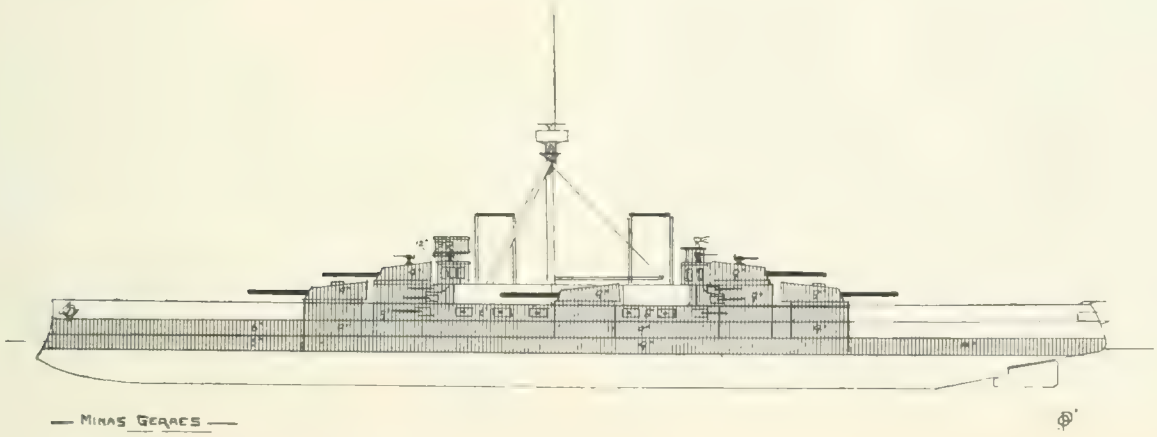
was the case on the *Henri Quatre*. This, in conjunction with a much thicker turret roof, might sufficiently deaden the blast concussion in the sub-turret to make a direct astern fire by all four guns practicable. We have, indeed, learnt from Admiralty have hitherto shown for the American arrangement. In answer to the second query, it might be argued that as future battle formations will be made so as to allow the maximum amount of broadside firing, these ships are being

built in order to secure this. To have had all the guns on the same level would have seriously interfered with their training, while by raising two turrets, better arcs of fire and a higher command are obtained, the direct keel-line bearing being neglected. To have raised the second centre-line turret in the *St. Vincent* would have been a useless expenditure of weight, as the guns already have a large arc of training, while to have heightened the barbette for dead astern firing—as was mooted—would have been useless. The after-turret lies in the zone where the blast from the guns firing over it would have the greatest effect, and they would in all probability put the men out of action who were working the lower guns.

In other respects, the ships contain no startling innovations that can be dealt with as yet. The *St. Vincent* may possibly not be fitted with tripod masts, although designed with them be built for far less and accomplish everything necessary. But now that Brazil has grasped the trident, Argentine promptly votes £11,000,000 for naval expansion. What will be the result? When each has her little fleet of "Dreadnoughts," the relative position will be the same, while £18,000,000 will have left the country. The natural course, therefore, would seem for a mutual arrangement to be made, as was the case between Chili and Argentine a few years ago, when both nations offered the warships they were having built to the highest bidder. We bought the now *Swiftsure* and *Triumph* from Chili, while Japan obtained the *Kasuga* and *Nisshin*. If such a course were agreed upon, it would be necessary for this country to purchase all three ships, the *Sao Paulo* (Barrow), *Minas Geraes* and *Rio de Janeiro* (Elswick) in order to prevent them falling into the hands of other powers and upsetting the balance of naval strength. Up till now,



— H.M.S. St. Vincent —



— Minas Geraes —

—everything depends upon the success of the new deck-controlled range-finders, and whether they will be perfected in time to make her heavy masting unnecessary.

Before closing, we should like to say a word regarding the final destination of the three Brazilian ships. The rumour that they were being built for a third power has been officially denied, and this is quite what was expected. Brazil may intend to form a fleet superior to all the naval strength of South America combined, and become Boss-Republic. But that could have been done without spending something like £7,000,000 on new warships. The *Royal Sovereigns* and other of our older warships could be obtained very reasonably, and these are all that would be necessary to achieve this end. To employ the *Minas Geraes* & Co. to keep the *Capitan Prat*, *Cochrane*, *Esmeralda* and other hoary antiquities in check is like using the proverbial steam-hammer to crack a nut. Even if national feeling soared above the purchase of second-hand ships, a modern 10,000-ton armoured cruiser or so could

no purchased warships have been satisfactory, as our requirements are far more exacting than those of other nations; the *Swiftsures* are too lightly built and cranky, the old *Neptune* (formerly the Brazilian *Independencia*) was one of the worst seaboats we ever had in our Fleet—if not the very worst. But in the case of the new Brazilian ships, such a contingency seems to have been foreseen, as the plans were fully *viséd* and approved of at Whitehall before they were put in hand. The *St. Vincent* was our standard, hence the *Minas Geraes* so nearly approaches it.

Whether the twelve big guns can be adequately controlled from the single mast range-finding station is a purely technical question. The single big tripod on the *Dreadnought* was insufficient, hence the two masts in later ships; whether the rig of the *Minas Geraes* will undergo modification should she hoist the White Ensign depends upon the improvements in range control apparatus and the practicability of armoured deck control positions.

ALEXANDER BOYLE.

THE office of Chief Examiner of Engineers, Board of Trade, is one of considerable importance, and, like all appointments of a similar character, not only is the importance an increasing quantity, but the responsibility grows year by year with the spread of education and the various channels through which technical education flows; the Examiner must keep ahead of the times in which his lot is cast. The subject of our illustration, Mr. Alexander Boyle, is fully alive to the cares of his office and the necessity of both theoretical study and practical requirements. Presiding at the meeting of the Institute of Marine Engineers

Alexander Boyle, M.I.Mech.E., Vice-President Inst. of Marine Engineers.

at the Franco-British Exhibition on September 5th, when Mr. J. T. Milton delivered his lecture, he evinced an interest in what was at once a happy blending of theory and practice, and it seemed fitting that the lecturer, Engineer-in-Chief of a premier society like Lloyd's Register of Shipping, should be introduced by the Chief Examiner of Engineers as chairman of the meeting.

Mr. Boyle is a Renfrewshire man, gaining the rudiments of his education and serving his apprenticeship as an engineer amid the echoes from the traditions of James Watt. Greenock has ever had a name for ships, steamers and machinery, and here Mr. Boyle learned to handle the tools and train his mind for what lay before him. Entering upon sea life, he joined the Leyland Line in 1872, then known by the name of John Bibby, Sons & Co., as a junior, and passed through the usual doors until he entered that of the chief engineer as such in 1875. Keeping up his intercourse with books, and not confining himself to the technical to the detriment of the other sides of the mind and experience of man, he pursued study for the love of it, gaining and pursuing knowledge for its own sake. He received an appointment to the Board of Trade as surveyor in 1884, and after service in London and Dover was transferred to Southampton where he became Senior Surveyor. On the position of Chief Examiner becoming vacant in 1905, Mr. Boyle was selected for the office, which he has filled with ability and high acceptance on the part of all whose duties call them to know what is being done to maintain the efficiency of the marine engineer. Mr. Boyle has been a member of the Institute of Marine Engineers and taken a great interest in its welfare for many years. He was Chairman of Council for several sessions, and is now a Vice-President of the Institute. Mr. Boyle is also a member of the Institution of Mechanical Engineers.

THE saving of fresh water at sea and what is equivalent to this, the use of sea water for many purposes with equal convenience and comfort to the user, and with more economical results, are important details in connection with all ocean-going steamers, so that whatever can be effected in either of the directions indicated is good and makes for economy in the running expenses. The cost of making fresh water from salt is an item to be reckoned with, whether it be made by the distiller or the evaporator, in either case it adds to the coal consumption, besides the tear and wear on the appliances. While it is less costly to carry fresh water in the ballast tanks for ship's use and the boilers, than to make it, considerations of cargo space and freeboard have to be met, along with the question of freight earning, hence the minimum quantity is a factor which enters very largely into the views of the superintendent as the sailing date approaches. Our attention has been directed to a soap and cleansing powder which can be used with great advantage for several purposes with salt water, giving equally as good results as ordinary soaps and powders which require fresh water to do justice to their cleansing properties. The soap and powder referred to are manufactured by a firm whose works are at Cubitt Town, London, E., Sapon, Limited, by whom it is claimed that not only are their products of manufacture good economical cleansers, but they are good disinfectants and insect destroyers. The firm do not confine themselves to the manufacture of salt water soaps for the ordinary purposes of sea service in cabin and bath-room, but have special soap for the removal of greasy stains and cleansing of greasy vessels, thus being serviceable for engine-room and scullery. The soft soap termed Pantasolv is good for removing old paint and in preparation for recoating, or thoroughly cleansing the paint work according to the amount used to effect the desired purpose. The samples we have tested, chiefly for fresh-water use, have proved to be very good cleansers; and those who have tested the salt water varieties have pronounced favourably upon them. All Sapon sea soap preparations may be used in fresh water if same is plentiful.

LECTURE ON THE CORROSION AND DECAY OF METALS.*

By Mr. J. T. Milton (Member of Council).

THE subject of the lecture to-night is of such importance both to the constructive engineer and the engineer whose business it is to attend to the maintenance of the structures placed in his charge, that no apology is needed in bringing it before the Institute of Marine Engineers. To the constructor, because he has to provide an excess of material in his design to allow for an inevitable deterioration which he knows will take place ; and thus at the outset, and right through the useful life of the structure he creates, he is handicapped by having to carry more weight than would be necessary if he could ensure that no weakening by decay or corrosion would occur. To the engineer in charge, because his every-day work includes the taking of precautions against the failure of each one of a large number of small details, the failure of any one of which, owing to the interdependence of so many parts of the mechanism, may produce serious consequences out of all proportion to the seeming importance of the detail in question.

By far the most important material used in engineering structures is iron in its various forms of cast iron, wrought iron and mild steel, and, unfortunately, iron is one of the metals most liable to decay or corrosion. The corrosion of iron is almost, but not invariably, due to its affinity for oxygen, and the consequent formation of oxide or rust. Cases of decay of cast iron however occur, to which reference will be made, where the formation of rust does not appear to be the sole cause of the trouble, but rather the formation of some soluble compound which is washed away or dissipated by the corrosive influence itself. Although the formation of rust is of such a common occurrence there is not by any means a concurrence of opinion as to the precise way in which rusting takes place. The presence of water seems to be essential, but water by itself will not rust iron. When bright iron is immersed in pure water which has been freed from dissolved air, it remains bright for an indefinite period, but, given the access of air or oxygen in solution in the water, rusting almost immediately sets in. It is stated that the action of oxygen and water is comparatively slow except there is also the presence of a small amount of free CO_2, and that when this is present the rusting is much more rapid. It is on this account that in cases where oxygenated water has necessarily to be kept in contact with iron the presence of a little caustic lime in the water is found to be preservative, the lime (calcic oxide) has a strong affinity for CO_2, forming calcic carbonate, and thus prevents the gas from remaining in the water. In the cases of many metals which are readily oxidizable (lead, for instance) it is found that when the outer surface of the metal has combined with oxygen, the thin film of oxide so formed prevents the access of further oxygen to the metal, thus stopping further corrosion. In the case of iron, however, this is not the case. It is unfortunately true that iron once rusted corrodes more quickly than clean iron when exposed either to moisture with access of air or oxygen, or when exposed to moist air. The reason for this is obscure ; but it has been said that the oxide of iron formed (FE_2O_3) will, under certain conditions, either of temperature or moisture or both, occlude or separate out and absorb from the air an excess of oxygen, whilst in other conditions of temperature, etc., it gives up the oxygen so occluded. Evidently if this is the case, when the occluding conditions occur the coating of oxide can most readily obtain the oxygen from the side nearest the air, whilst when the reverse conditions occur it can equally readily divest itself from the excess of oxygen by yielding up some of it to the contiguous iron on one side as by giving it up to the air on the other side of the film. Whilst this is a possible reason, it may not be the only reason for the continuous oxidation of the iron covered by a film of oxide. It may be that the oxide itself is not an absolutely coherent solid mass such as the ordinary senses imagine metals to be, but it may really be of a porous structure, with openings or vacuities sufficiently large for molecules of oxygen to freely penetrate them and so obtain access to the iron underneath, or even sufficiently porous to contain enough moisture to support an electrolytic action, to which reference will presently be made. However, the important fact remains that a coating of rust once formed on iron is no protection whatever against further oxidation, but the reverse, so in all cases where rust has once formed it is best to remove it as soon as possible. Evidently the best way to prevent iron from oxidation is to prevent the corrosive influences from coming into contact with it, and for this purpose, whenever the use of the structure will permit it the surface should be covered with something to keep air and moisture away from it. The most usual protection is paint, while cement, asphalt and galvanizing are also employed with more or less success.

The subject of paint is one well worth study by engineers, but is too complex to be dealt with in the present lecture beyond making the statement that an ideal paint is one which can be easily spread on the iron, will not flake off, and will quickly dry into a hard coherent coating so continuous or free from porosity that it will not permit of the passage of moisture or of air through it. Portland cement is usually employed only for parts where water is always present, and experience with the inner surfaces of the bottoms of iron and steel ships shows that where it has been put on of sufficient thickness to ensure durability it effectually prevents corrosion, both when applied originally to the bare iron and to iron previously coated with good paint. The thin coating of " cement wash " applied to parts which cannot be cemented in the ordinary way, however, cannot have the same good character given to it, as we see by the severe wasting which occurs to the floors and reverse frames, tank tops, etc., of vessels which have been treated in this way whilst building.

Galvanizing is a process of covering the iron with a thin film of zinc, and is very efficient for a time in most cases in which it can be applied, and where only atmospheric influences have to be resisted ; but after a time the zinc becomes wasted and its preservative effect is lost, and as the iron cannot be again galvanized the further preservation must be attempted by means of paint. At first, protection is afforded simply because the first coating of oxide which the zinc surface acquires protects the metal from further oxidation, but this in time wears off, more oxide forms, and at last the zinc coating in spots becomes completely worn through, leaving the iron surface exposed. The preservative effect, however, has by no means been lost, and the iron in the exposed parts is still preserved by the zinc remaining on other parts through galvanic action ; and not until the zinc has practically disappeared from the whole surface does the now exposed iron begin to corrode.

If two dissimilar metals are immersed in a corrosive liquid, or exposed to a corrosive atmosphere which will act on both of them, so long as they are not brought into electric contact, each is acted upon in precisely the same manner as if the other was not present ; but if the two metals are brought into electric union, then the whole of the corrosive influence is transferred to one of the metals, the other being protected ; at the same time an electric current is set up which proceeds from the most corrodible metal through the liquid to the other metal, thence through the electric path back to the most corrodible metal. If a plate of zinc and one of iron are immersed in salt water and electrically connected, the iron will not corrode, but the zinc will. In common language the iron is protected at the expense of the zinc. This is the principal upon which depends the preservation of boilers by means of zinc plates placed in them. In a worn place of galvanized iron there is electrical communication between the iron and the remaining zinc, and so the iron is preserved at the expense of the zinc so long as any remains. At the same time let it be noted that there is a galvanic current produced flowing through the electric connexion from the protected metal to the more corrodible metal. The energy of this current is proportional to the chemical action, which is represented by the corrosion. Although we have taken iron and zinc as our illustration, the same results hold with any two dissimilar metals, one at least of which is acted on by the corrosive fluid, and we constantly meet with cases in which dissimilar metals placed in electric contact at one part, and subject to the same corrosive action at other parts, set up a galvanic action which results in the protection of one of the metals at the expense of the other. Even when

* Delivered in the Congress Hall, Franco-British Exhibition, Sept. 5th, Mr. Alexander Boyle (Vice-President) in the chair.

two metals so much alike in chemical and physical properties as wrought iron and mild steel are used together, the slight differences between them lead to some galvanic action when they are exposed to suitable conditions, and usually the wrought iron is then preserved at the expense of the mild steel.

Take a glass vessel (see Fig. 1), containing a liquid of slight corrosive power*, insert in it two plates, one of iron, the other of copper, and, so long as there is no electric contact, both plates are acted upon in the manner peculiar to themselves and to the corrosive liqnid ; but connect the plates, say by a wire, and we have at once a current set up as indicated by the arrows, and at the same time the iron plate is more actively corroded than before, while the copper is preserved. If now instead of *I* and *C* being both immersed in the same liquid, which conducts the current from *I* to *C*, they were immersed in separate cells which have no electric conductivity between them (see Fig. 2), no current is set up and no protection is afforded to *I* by *Z* even although they are connected by the wire. For the galvanic action to take place therefore it is essential that the current should flow from *I* into the liquid and from the liquid into *C*. This can be arranged by immersing a connection *B* in both cells and we then have the complete galvanic action produced. Note that the corrosion takes place where the current leaves

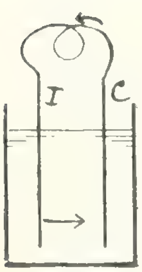


fig 1

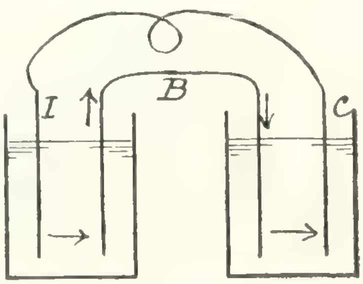


fig 2

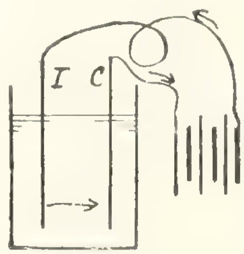


fig 3

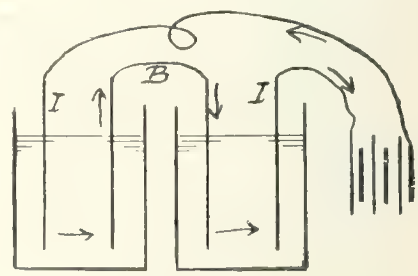


fig 4

I to go into the corrosive liquid. Now instead of the right-hand cell let us suppose we have a source of electricity supplied altogether distinct from that obtained through the plate *C* (see Fig. 3), so that we get a current entering *I* of the same intensity as before, and the same intensity of current consequently leaving *I* into the liquid. *I* will then be under precisely the same conditions as before in being exposed to a corrosive medium and in having a current passing through it, and it will be found that it corrodes exactly as before. We see then that one condition to ensure corrosion is that a metal shall be exposed to a corrosive influence, and that a current shall flow *out* of the metal into the corrosive liquid. This action is the cause of much of the wasting of water and other pipes in the earth due to leakages from electric mains, and the return electric rails in tramways, etc. We now see that all that is required to set up corrosion in a piece of metal is that a current produced somehow, either by the corrosive influence itself or by some altogether extraneous means, does leave the metal where it is in contact with a corrosive element, and that then the amount of corrosion so produced is proportional to the amount of the current and to the time during which it acts. It is evident that if the same current is distributed over a large surface so that its intensity per unit of area is small, the corrosive effect or loss of weight of the metal per unit of area will be less than if the same current is concentrated on a smaller area. Hence we see that if the surface of the metal is for any reason generally obstructive to the flow of the current, but at the same time certain parts of it are less so than others, so that these parts conduct more than their own share of the current, then these parts will receive more than the average of the resulting corrosion, or in other words, they will become "pitted." It is this which leads to severe pitting in places where paint or protective scale has been accidentally locally removed, and it points to the importance where scaling has to be done, of having it thoroughly done, otherwise the freshly cleaned parts will receive all the corrosive influence which ought to have been distributed over a larger area.

We will now take two cells and a battery, and arrange matters so that in one cell the current from the battery enters the iron plate to be corroded, flows through the liquid to the other pole, which we will make of carbon, which is an incorrodible material, thence to a similar carbon pole in the second cell, then through the liquid to another iron plate, and back to the battery. We shall find that in the first cell, as before, corrosion occurs on the plate where the current leaves the plate to enter the liquid, but in the second cell where the current *enters* the metal from the liquid no corrosion whatever occurs, even although there is precisely the same current passing through both cells. If we make the current concentrate a more than usual proportion on one particular point, we shall find the iron in a short time will be pitted right through.

Two instances only will be mentioned of sources of current affecting corrosion on board ship : First, electric machinery ; second, the differences of temperature to which different parts of the structure are subjected. Electric leads are constructed on two systems, the single wire with hull return, and the double wire. In the single wire the current leaves one pole of the dynamo and is distributed as required by a system of branching mains. From the lights, etc., it is returned to the structure of the ship, and thence to the other pole of the dynamo. The conductivity of the steel hull of the ship is so enormous that it seems at first sight that absolutely no current could leave it between the points where it enters and the connexion to the dynamo pole ; but where there are several ways open for a current to traverse, it is known that it will divide itself between all of them, the portion flowing through each path being inversely proportional to the resistance of that path, so that some current, however slight, must flow through every possible path between the electric light connexion and the dynamo pole ; and if one such path lies along a way where the current will leave a corrodible metal to enter a corrosive medium, some corrosion will take place there. With a leaky cable the leak similarly distributes itself over every possible path to the hull of the ship, and it may be that in some cases it finds a short path through some pipes or fittings which it corrodes, and which otherwise would be unaffected. In the double-wire system a defect in one cable only will not leak electricity unless there is a means for the electricity to return to the other cable. If there are defects in both cables, then the leakage from one to the other divides itself between every possible course. In this way, with either system, we get what engineers on board ship term "stray currents," very difficult to detect, but very serious in the long run, not so much on account of the loss of power of electric plant they represent, but because of their *sure* though *slow* action in effecting the corrosion of some part of the vessel.

(*To be Continued.*)

* In these experiments the liquid used was water with one part of nitric acid to 200 of water, and a little common salt to increase its electric conductivity, and a small quantity of ferrocyanide of potassium. The latter gives an intense blue colouration when there is a trace of iron present.

THE LUNE VALLEY WATER-TUBE BOILER.

THE development of the water-tube boiler for the purpose of supplying high-pressure steam in great quantity with a small weight of boiler has been well marked in recent years, owing to the demand for such a device for motor vehicles and steam launches, and we have pleasure in illustrating and describing the Kitchen & Perkins Patent Water-Tube Boiler manufactured by the Lune Valley Engineering Company of Lancaster, as this boiler has been in practical use now for sufficient time to demonstratively prove its claim for high duty per unit of weight.

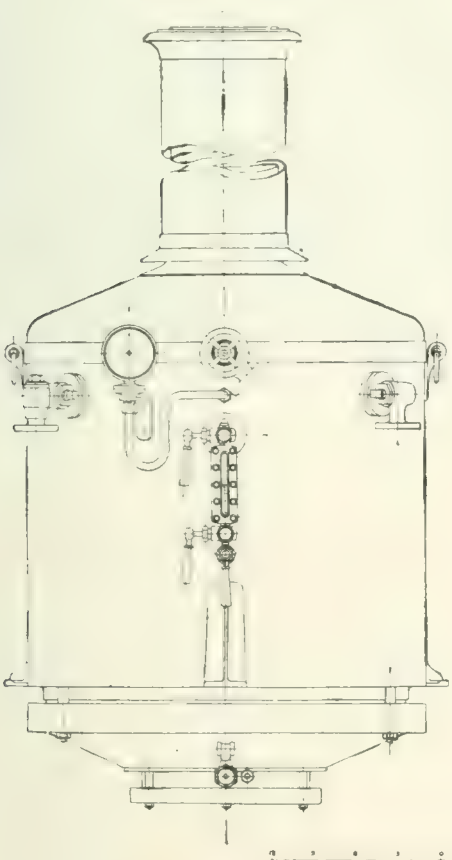


Fig 1

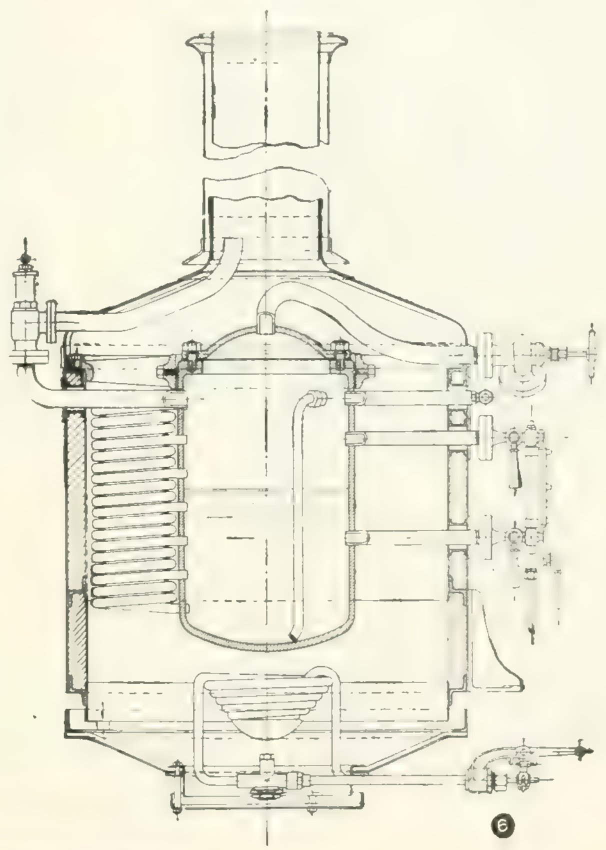


Fig 2

Fig. 1 shows an external view of the boiler. Fig. 2 shows a vertical section. Fig. 3 shows the heating elements and the other parts with which they are associated in elevation, the casing being removed. Fig. 4 is a plan of the same.

The object that the manufacturers had in view was the designing of a boiler combining the advantages of a wet boiler with the high efficiency, rapid steam-generating properties and safety of the flash boiler. Referring to the illustration, it will be noted that the boiler consists of a central drum pressed out of a single steel plate and external coils of mild steel arranged in such a way as to expose good hit and miss surfaces to the hot gases and allow at the same time of easy cleaning. Each coil makes three turns and the ends are expanded into holes in the central drum, an arrangement which allows a perfectly free expansion and contraction without any possibility of leakage, and at the same time permits of any coil being easily removed and replaced when necessary without interfering with other coils. By reference to Figs. 3 and 4 it might be assumed that the coils start at the bottom of the shell, continue in one convolution and make their connection at the top of the shell; but on close examination it will be found that this is not the case, as each slewed spiral is made up of a group of successive coils, each having only three convolutions, thus effecting a very rapid circulation owing to the short length of each coil. As evidence that no danger can occur through shortness of water, practical tests have shown that the boiler can be made red-hot and have water pumped into it under this condition without any damage occurring. Any class of solid fuel, such as coke, coal or wood, can be used, but it is pointed out that this type of boiler is particularly useful when oil fuel is employed, and the evaporative efficiency is of a high character, judging from the actual use of the boiler with paraffin as a fuel, showing the evaporation of fifteen pounds of water per pound of oil

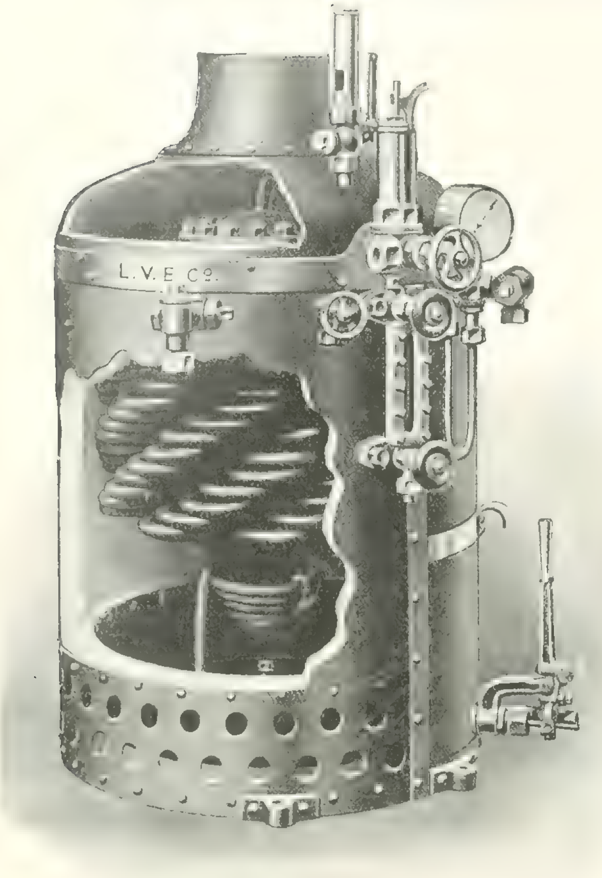


Fig. 4 Plan of Boiler (Casing removed.)

Fig. 3 External Elevation (Casing removed).

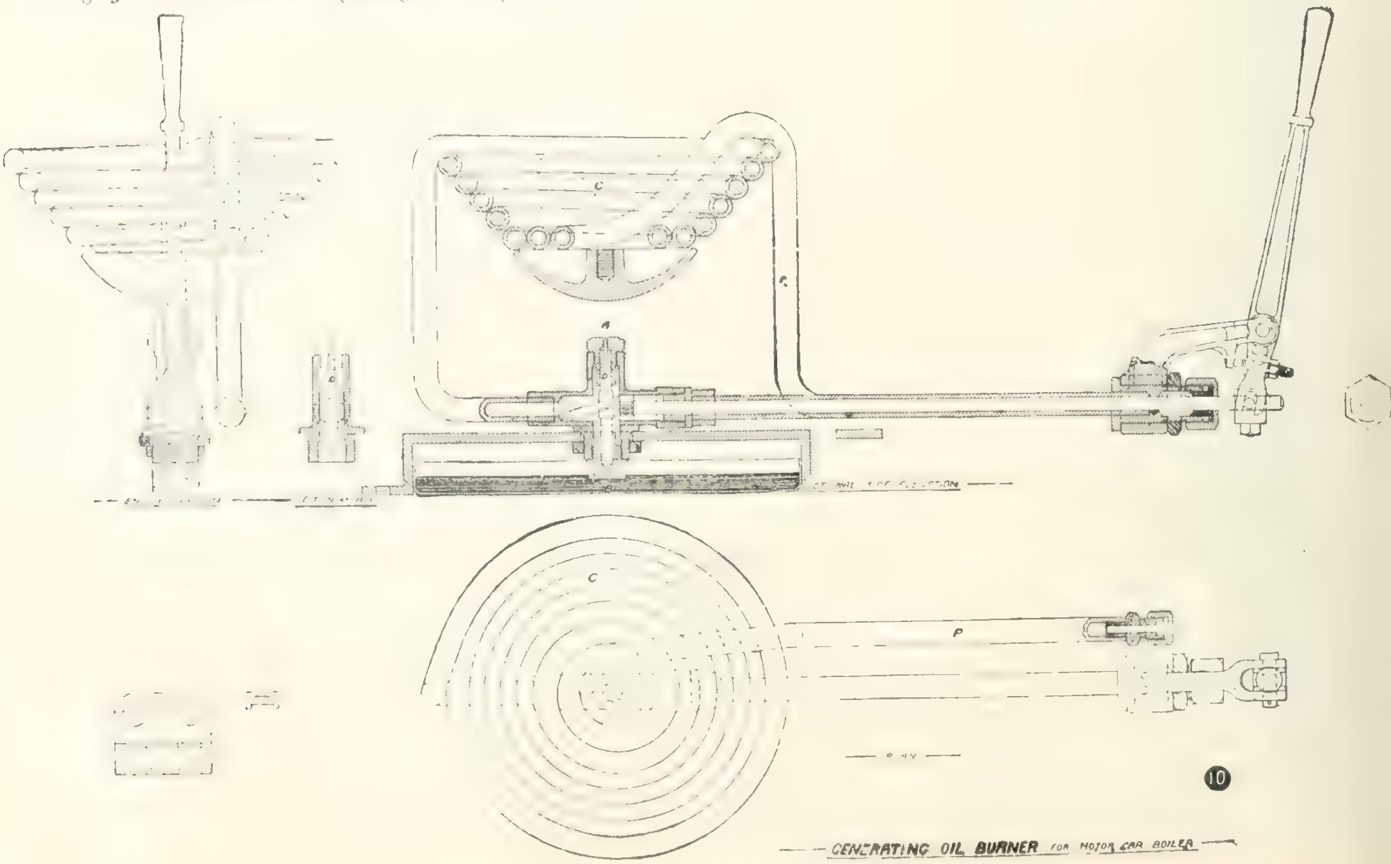


Fig. 5. Patent Paraffin Burner.

from and at 212° Fahr. We understand that steam at a pressure of 300 pounds per square inch can be raised from cold water in about eight minutes, including the time required for lighting the burner.

Considerable attention has been given to the construction of such burners by the Lune Valley Engineering Company, and the burner illustrated in Fig. 5 is the result of an extended series of careful experiments made by the manufacturers, the objects aimed at being simplicity with a minimum of working parts, elimination of the "Bunsen" flame, with its accompanying induced draught, air regulators and liability to "back-firing" and blowing out, and high heating efficiency. The construction and working of the burner being clearly shown in the illustrations, little description is necessary. Common paraffin or "kerosene" oil is used, and an air-pressure of 20 to 30 pounds per square inch is used in the oil reservoir. The oil passes to the burner by the pipe P, and being vaporized in the coils C, issues in the form of gas from the jet or nozzle A, where it is lighted. The jet impinges on the inverted dome-shaped deflector, over which it spreads in a thin film, taking up the right amount of air for complete combustion, so as to produce, when working "full on," an intensely white-hot, smokeless flame. The flame is regulated by the needle D which projects through the nozzle, and is operated by the hand lever, as shown, which is the only working part of the burner. As may be seen, there is nothing to burn away or get out of order, and there is no possibility of back-firing; at the same time it is practically impossible for the burner to be blown out. By way of proof that it does what is claimed for it, we are informed that several of these burners have been in constant use for five and a half years without having been cleaned or requiring any repairs or renewals during that period. It will be noticed that every time the flame is regulated the needle performs a clearing action in the nozzle and prevents the possibility of it becoming clogged up. Hence no "prickers" are required, as with other makes of burners.

In order to light up the burner it is only necessary to set alight three ounces of methylated spirit in the asbestos-lined tray under the nozzle. By the time this has burned out the coils will be warm enough to allow of the oil feed being slightly opened, and in three minutes from starting the burner may be full on. In cases where the boiler is fitted with a funnel, a small quantity of the fuel may be allowed to escape from the nozzle and ignited in the tray, saving the separate carrying of spirit. The burner may be used successfully with any type of boiler, but it is essential to provide ample flue area so that the hot gases may get freely away. We understand that these burners have been used with great success under some of the most trying conditions possible to be found, where no form of solid fuel firing could be carried out, owing to the weight and space limit being too small, in particular in small high-speed launches, where the size of the boat prohibits a closed stoke-hole being fitted to enable a maximum fuel consumption per square foot of grate to be burnt. We may mention one instance, the steam racing launch, *Rose-en-Soleil*, which was built and engined by Messrs. Simpson, Strickland & Co., Ltd., and although only forty feet in length, she achieved a mean speed of 24·5 knots per hour.

LIDDLE'S PATENT CONCENTRIC CAPSTAN.

WE referred incidentally in our last issue to an exhibit at the Edinburgh Exhibition by Messrs. Mitchell, Graham & Son, and by the courtesy of that firm we now reproduce an illustration of their Liddle's Patent Concentric Capstan. This capstan and driving motor are built together as one machine, thus dispensing with much of the casing,

gear and connections usually found in other capstans for similar work, and giving at the same time perfect balance of motion with duplicate gearing. The motor may be electrical for either continuous or alternating current and of any desired voltage. The driving power may also be arranged for steam or hydraulic. From the illustration it will be seen that the capstan has two diameters of drum; it may also consist of a drum arranged with a variation of speed controlled by a lever or hand-wheel. The gears are inside the capstan head concentrically with it, and run quietly in a bath of oil; the friction is thus a very low percentage of the driving power, which is practically that given out by the motor, and can be made to suit the desired purpose of the capstan for power and speed. The fitting expense is low, and the gyroscopic action of the mechanism is an advantage in tear and wear and efficiency. The gearing, being well protected, renders this capstan handy and suitable for exposure to wind and weather conditions of service.

ELECTRICAL NOTES.

(From Our Own Correspondent.)

Commutator Troubles.

WITH the keen competition existing in the electric trade and an endeavour to increase the output of machines and at the same time maintain a low temperature by thorough ventilation, fewer slots are employed per pole, and as many conductors as possible are used per slot. There are thus in machines of moderate size often six coils per slot, with as many commutator segments and as few as seven slots per pole. With a machine like this it is impossible to use a brush sufficiently wide to short circuit the full group of conductors in a slot simultaneously, and often we find a brush used covering four segments only. The conductors undergoing commutation are therefore placed in different parts of the commutating field. These must therefore be placed under the brush where the current density attains a large figure and here there will be burnt bars. The trouble varies in different cases. We may find two blackened segments and four bright ones, while we may have alternate ones so marked. As we say, the crowding of say six coils into a slot and working with a small number of slots is the possible cause of the trouble. If a brush of sufficient width were used to short circuit a full slot of conductors, sparking would occur, due to excessive resistance voltage. The remedy appears to be to increase the air gap, which it must be said is likely to increase the cost of the field copper, but if we do this and have three coils per slot with only four commutator segments, there is likely to be a complete absence of trouble.

Electrical Accidents.

With the Home Office report, just issued, we are naturally led to enquire what are the causes which conduce to these from a Government point of view. Switchboards were answerable for a good number when the operators were engaged in their ordinary routine work, due, it is said to faulty design or carelessness on the part of operators in handling boards supposed to be dead. Another contributory cause is given as occurring during the adjustment of brushes. A mishap was due to a leaky hand lamp, while a man was working with it inside a boiler. The continuous current supplied was, however, shut off in time to prevent more than a severe shock. Unprotected conductors, terminals, fuses, etc., caused three deaths, but faulty apparatus generally is given as occasioning the greatest number of cases, fatal and otherwise. A singular accident was the insulation of a conductor in a works being cut through by a man carrying a piece of iron. The pressure was 250 volts alternating current, but the man was killed instantly. Another case was of a man touching with an iron rod the frame of an arc lamp working at high pressure, the frame of the lamp forming part of the circuit. The inspector notes the great danger of ordinary hand lamps, the metal work being liable to become electrically charged in many and various ways. He also says low voltage is no protection, there having been three fatalities from continuous current during the year with pressure of 250 volts or less. Altogether the report is most instructive and we may refer to it again.

Electricity on Shipboard.

A recent paper read on this subject at Liverpool, showed very fairly where electricity gains and loses by its application on a vessel of 6,000 tons and 1,600 H.P. The initial cost is put down as £630 more than for steam, but there is an estimated saving of £180 per annum in coal. The use of current, however, is proportional to the load and the cleanliness and silent running is in favour of electricity. When the gear is in constant operation, the cost will be reduced. Another point is that with winches and cranes, the motor and gear can be placed under the deck and protected from the weather. There is certainly a tendency at the present time to electrify the auxiliary machinery on vessels, as we know.

Electric Capstan.

A novel feature in this class of work is embodied in a machine designed by the Clyde Navigation Trust. A wire rope is permanently fixed to the capstan head, which is made to run loose on the spindle, but when required is connected up by a clutch sliding upon the upper end of the spindle inside the capstan head. The starting switch and clutch are controlled by a long lever, which in the backward position releases the head by throwing out the clutch and in the other direction puts in the clutch and operates the starting switch. Such an arrangement is very useful for dock work, as, for instance, in hauling waggons one at a time.

Commutator Grinder.

A form of this class of tool has been introduced by Mitchell's Emery Wheel Co., of Bradford, Manchester, by means of which the commutators of dynamos and motors may be ground in place. The machine is fixed on a stand to suit either a definite height of centre, or on a stand which will allow the height to be altered to deal with a number of machines of varying height. A feature of the machine is that the wheel spindle, top slide and feed screw can all be reversed, enabling either right or left-hand commutators to be ground, the traverse being provided with adjustable stops, which can be set for any width of commutator.

MESSRS. ALFRED GRAHAM & CO.—We have received an illustrated catalogue from Messrs. Alfred Graham & Co., of St. Andrew's Works, Crofton Park, London, S.E., with reference to patent loud-speaking naval telephones, manufactured by them. This catalogue deals with the important improvements which have been effected in the firm's system of loud-speaking telephones, and forms excellent means for drawing the attention of shipowners, shipbuilders, engineers and others to the details of construction and the merits claimed for each class of instrument. In addition to over two hundred vessels in His Majesty's Navy which have been provided with the apparatus, the Argentine, Brazilian, Danish, French, Italian, Japanese, Netherlands, Peruvian, Portuguese and Russian Admiralties have had vessels fitted up, and a large number of the largest and best liners owned by the leading shipbuilding companies have also had installations of the apparatus on their ships. The catalogue is profusely illustrated with diagrams, and useful illustrations are given as to how to use and how not to use the loud-speaking telephones. Besides being of a watertight construction, the loud-speaking instruments are designed to withstand rough usage and gunfire, and to afford sufficient service under conditions which would render any ordinary telephone apparatus unserviceable. In addition to the matter and illustrations dealing with the apparatus, views and descriptions are given of the firm's works at Crofton Park, London, S.E., from which it can be gathered that the works are of an up-to-date character and are furnished with the most modern machinery of the labour-saving type.

THE INDIA RUBBER AND ALLIED TRADES EXHIBITION, held in Olympia from Sept. 12th to 26th, proved a most interesting one, valuable from an educational point of view and, we hope, profitable from an exhibitor's point of view. The exhibits consisted of different samples of rubber from the exudations gathered on tapping the trees to the finished article in tyres, waterproofing, sheeting or packing; also the machinery used in the various processes. It was a matter for congratulation to note that the steady increase in output of rubber from British territory seemed to be considerably ahead of other plantations, which have been longer established. The exhibits from Brazil were great and excited much attention, as became a country famous for its rubber, the quality being recognised and the quantity supplied to the market the greatest of any territory. A graphic diagram by Messrs. Gore, Wilson and Stanton shows very clearly the immense amount exported by Brazil and the steady increase in the contributions to the market by Ceylon and the Malay Peninsula. Travancore, British Guiana, St. Lucia, Trinidad, Dominica and other places are advocating claims for a share in the growth of rubber, and are doing their best to have their claims established. The young trees and specimens showing the growth month by month and year by year are of interest as showing the care and attention necessary for the up-bringing of the plants; we are indebted to exhibitions of this character for bringing before us the possibilities of enterprise in connection with the raw materials required for our industrial work.

Industrial and Trade Notes.

THE CLYDE AND SCOTLAND.

(From our Own Correspondent.)

Advance in Shipbuilding Steel.—During two or three days at mid month a considerable quantity of steel was purchased by consumers and merchants. On the 14th and 15th, especially, the bookings for material were on a very large scale, and realizing the portents of the situation the leading producers on the forenoon of the 17th closed their books, declining to meet further requirements on the old terms. In view especially of an advance on the price of hæmatite pig iron, the Scottish Associated Steel Makers agreed on the same day to advance the price by 5/- per ton. Makers' prices are now brought up to the level at which they stood at the beginning of March, namely, ship plates £6 7s. 6d.; boiler plates, £7 2s. 6d.; bars, £7, and angles £6, all less 5 per cent; but still 5s. a ton under what ruled at the beginning of the year, and 30s. a ton below the best points touched in 1907. Makers are now much more hopeful that they will keep their works fairly well employed, indeed, it would seem that they have concluded that a great deal more shipbuilding and other constructional work has been placed in the Clyde district of late than has been reported or understood. It is also believed that now, when buyers realize that lower prices are gone for the time being (on which they have all been speculating), they will cover their wants and so give the steel and other trades a distinct lift forward.

Shipbuilding Depression and Prospects.—What is above stated, however, reflects mainly the point of view of the steel producer. Steel merchants, and shipbuilders especially, have no such decidedly hopeful outlook as is here implied, and they regard the advance as likely to postpone the general and genuine revival in the shipbuilding industry. The settlement of the long-drawn out wages troubles amongst the engineering sections of workmen on the North-East Coast, when it is brought about, will doubtless tend towards assurance and enterprise on the part of shipowners and builders. Meantime, unemployment is very general and in some departments of industry extremely acute, and has given rise to violent demonstrations on the part of the working population. This has helped possibly to accelerate the schemes of monetary assistance and special employment which the authorities of Glasgow and other centres of industry on the Clyde have certainly long been contemplating. A general fund, started by the Lord Provost, and one independently by the *Glasgow Herald*, have been most generously contributed to by employers and the well-to-do in all sections of the community, and there is thus some likelihood of the approaching winter months being marked by less of the distressful condition of things which a short time ago seemed inevitable. Doubtless, as will be gathered from what follows, a considerable amount of tonnage has been placed, a large proportion of which, however, is of shipping intended for general "tramp" purposes. Regarding this, it is felt that while momentarily benefiting the shipbuilder and engineer and their working forces, it may really be regarded as impolitic and wrong from the point of view of shipowning interests. With regard to the reported orders from the various tramp steamship companies placed on the Clyde and elsewhere, shareholders, at any rate of several companies, express their great dissatisfaction. They contend that at present prices, it might be a good investment to buy steamers just built, but it is unnecessary to order further vessels when there are hundreds new and practically new, which can be bought just as cheap, if not in some cases cheaper, than anything that can be built. The tonnage already afloat or on the stocks forms, of course, an accomplished fact, but it is, in such critics' opinions, suicidal at present to build more.

New Contracts.—The following orders, set down mostly in the order of date of placing, are items of considerable interest in view of above statements. Messrs. D. & W. Henderson, Ltd., Partick, have been commissioned to build and engine a screw steamer for the Aberdeen Steam Navigation Co., which will be the largest in the Company's fleet. Messrs. Russell & Co., Port Glasgow, have now ten of their thirteen building berths occupied, orders for three steamers of large carrying capacity having been received near the beginning of September. The machinery for these will be supplied by the Clyde Shipbuilding and Engineering Co., Port Glasgow, and Messrs. John Kincaid & Co., Greenock. Messrs. A. Rodger & Co., shipbuilders, Port Glasgow, early in September booked an order for a screw steamer of large tonnage, the engines for which will be made by the firm's own engineering department in Helen Street, Govan. The Greenock and Grangemouth Dockyard Co. have received from Messrs. Lane and McAndrew, London (acting on behalf of clients) an order for a 6,000-ton oil steamer, similar to the vessel which they built recently for the Pure Oil Co., New Jersey, U.S.A. The vessel will be of the most modern type, for carrying all kinds of oil. Engines, which will be placed amidships, will be supplied by Messrs. J. G. Kincaid & Co., Greenock. The same firm have received an order for a steamer, 265 feet in length, for the Eastern trade. The first vessel, and probably the second, will be built in the firm's Greenock yard. Still another order, booked by the Dockyard Co., is for a tug steamer, 100 feet in length for Buenos Ayres, which will be a duplicate of the *Avestreuz*, built by this firm some time ago. The new vessel will be laid down in the Company's Greenock yard and engined by Messrs. D. Rowan & Co., Glasgow. The Scott's Shipbuilding and Engineering Co., Greenock, have received an order from Messrs. James Gardiner & Co., St. Vincent Place, Glasgow, for two steamers, each of 7,600 tons, the engines for both of which will be supplied by the Company. The Campbelton Shipbuilding Co., whose yard was inoperative for about two-and-a-half months, restarted work during the first week of September. The Company have received orders for two screw steamers. One of these will be of about 2,000 tons deadweight, to the order of Messrs. J. & P. Hutchison, Glasgow. The machinery will be supplied for this vessel by Messrs. D. Rowan & Co., Glasgow, and delivered as required at the beginning of the year. Messrs. Charles Connell & Co., Whiteinch, have received an order from Messrs. James Gardiner & Co., St. Vincent Place, Glasgow, for three steamers, each of 7,600 tons carrying capacity. Machinery for these vessels will be supplied by Messrs. Dunsmuir & Jackson, Govan. Messrs. Russell & Co., Port Glasgow, have received an order from Messrs. Marshall & W. L. Dobie, Glasgow, for a cargo steamer of 7,500 tons deadweight. Engines will be supplied by Messrs. Rankin & Blackmore, Greenock.

Floating Dock.—Messrs. William Hamilton & Co., shipbuilders, Port Glasgow, who about two years ago produced two floating docks for the port of Rotterdam, which are now doing good service there, have contracted to build for Norwegian owners a floating dock, capable of lifting vessels of 7,000 tons deadweight carrying capacity. The dock will be of the self-docking type, composed of five detachable sections. Each section will have a centrifugal pump driven by separate electric motors. The builders have undertaken to deliver the dock at Christiania within nine months.

One Busy Yard.—One of the few busy shipyards on the Clyde at present is that of Messrs. Yarrow & Co., Scotstoun, who have work enough on hand to last them for two years. Of the ten torpedo boat destroyers which the firm are building for the Brazilian Government, the *Para*—the first vessel launched from the new yard—ran preliminary trials on the Firth of Clyde early in September. Another destroyer, a sister ship, named the *Piauhy* was launched on September 7th and has since been put through preliminary trials. The work on hand at Messrs. Yarrow's establishment, in addition to the destroyers, includes a shallow-draught gunboat for the Portuguese Government of 120 feet in length; a shallow-draught steamer for service on the river Magdalena, in South America; a shallow-draught steamer for navigating the upper reaches of one of the rivers in New Zealand; and also a complete set of twin-screw machinery to be fitted on board a shallow-draught steamer being built by Messrs. Rennie, London, for the Tigres and Euphrates Navigation Co. All the shallow-draught vessels referred to will be propelled by twin-screws working in tunnels, fitted with Yarrow's patent hinged-flap aft, which secures the maximum efficiency under all conditions of draught.

Naval Work.—H.M.S. *Inflexible*, the Clydebank sister ship to the Fairfield's *Indomitable* and the Armstrong *Invincible*, was taken up the river Clyde to Govan and docked on September 11th for hull cleaning and final examination. Her stay in the dock was marked by much interested inspection on the part of the public. After a prolonged stay in the Clyde, the

Russian cruiser *Rurik* left the Tail of the Bank on September 9th, having a few days previously been handed over to her owners by the builders, Messrs. Vickers, Sons & Maxim, of Barrow. The vessel came round to the Clyde in June last, and since then she has from time to time undergone exhaustive trials on the Firth. The new torpedo boat destroyer of the coastal type "No. 18," built by Messrs. William Denny and Bros., Dumbarton, having completed engining at the builders' basin, was taken to Greenock on September 17th, and was placed in dry dock by Scott's Shipbuilding and Engineering Co., prior to running her speed trials. The trial of the torpedo boat, *Para*, the first to be completed of the fleet of ten similar boats which Messrs. Yarrow & Co. have on hand for the Brazilian Navy, and the launch of the *Piauhy*, the second of the batch, are matters elsewhere referred to. The trials of the latter vessel as well have taken place. All the Clyde shipbuilding firms on the Admiralty list who specialize in torpedo craft have sent in tenders for a share of the batch of fourteen torpedo boat destroyers, forming part of the naval shipbuilding which is to be given out this financial year. These are:—Messrs. Yarrow, of Scotstoun, Brown & Co., of Clydebank, Denny Brothers, of Dumbarton, Beardmore, of Dalmuir, the Fairfield Co., and the London & Glasgow Shipbuilding Co., Govan. The vessels are to be of moderate speed—27 knots—and they are to burn coal exclusively, and have carrying capacity for a wide radius of action. High hopes are entertained that at least a fair share of the contracts will be secured by several of these firms. Although the tenders are now under the consideration of the Admiralty, the contracts are not likely to be placed for some little time. The problems involved in the production of these vessels are, according to many of the tenderers, somewhat difficult of solution, and many troublesome adjustments may have to be made before final allocation is arrived at. It is hoped, however, that these processes will be rapidly pushed through, as there is quite evident appreciation in official circles of the fact that work is badly needed, not only on the Clyde, but in all the shipbuilding districts.

Light Draft Shipbuilding for Shipment.—While the present depression in the shipbuilding industry on the Clyde is eloquently betokened by the beggarly array of bare poles and staging in the shipyards on the river banks, it is interesting to record that in one special direction, which is apt to be overlooked in the periodical returns of new tonnage produced, there is at present, as there is almost constantly, a gratifying briskness. We refer to the shipbuilding work of a light description which is prepared for shipment in pieces and re-erection abroad. The yards in which such work is chiefly undertaken are not necessarily near the river, where they would have to be if the ships were finished completely and launched, but are in a number of cases far removed from the river banks. One such case is that of Messrs. Alley & McLellan, of Polmadie, where for very many years a large amount of light draught work for shipment has been carried on. The firm are at present engaged upon a variety of light draught craft, consisting of cargo berths and steamers for river service in remote parts. Another firm, who have all along produced such vessels in large numbers, for Indian river service especially, is Messrs. William Denny & Bros., Dumbarton. While this firm have, of course, their main shipbuilding berths on the banks of the river Leven, all the work of the kind referred to is undertaken outside of the bounds of their yard proper, where Nature's greenery and agricultural operations are in evidence rather than the grime and stir of shipyard operations. For the Irrawaddy Flotilla Co. alone, this firm have built an enormous amount of tonnage and they still have a share of the increasingly large needs of this prosperous Eastern concern. Messrs. Bow, McLachlan & Co., Paisley, and Messrs. Ritchie, Graham & Milne, Whiteinch, are other two firms noted for their productions in this line, but at present neither of the firms has much on hand, although it is understood prospects are brightening and substantial contracts may soon be secured.

Electricity on Board Ship.—Messrs. W. C. Martin & Co., Glasgow, have secured from the Orient Steam Navigation Co. the contracts for the electric installation of three of the five new liners at present building for their Australian Mail service—two by Messrs. Workman, Clark & Co., Belfast, and one by the London & Glasgow Co., Govan. The remaining two—at Messrs. John Brown & Co., Clydebank, and the Fairfield Co., Govan, respectively—will have installations by their builders, who have each a fully-equipped electrical department in their works. Messrs. W. C. Martin & Co. are also to fit with electric light and other apparatus the large train ferry now building by Messrs. Swan, Hunter & Wigham Richardson, Walker-on-Tyne, for the Swedish State Railways. The same firm were responsible for the installation of electricity for lighting, heating and ventilation and power purposes on board the Union Steamship Co.'s steamer *Makura*, which has just been completed by Alexander Stephen and Sons, Linthouse. Considering the dimensions of the vessel, this is one of the largest installations yet fitted. Altogether 2,000 lights are fitted, while there is an electric heater in each state-room as well as an exhaust fan for withdrawing the vitiated air. Motors also drive appliances in the kitchen, scullery and laundry departments of the vessel, which has splendid accommodation for about 230 first-class, and a correspondingly large number of second and third-class passengers.

Dundee Shipbuilding.—Since the beginning of September, the Caledon Shipbuilding and Engineering Co., Ltd., Dundee, have secured contracts for three additional vessels, making the number on hand in their yard five, all of which are for high-class passenger-carrying as well as cargo. One vessel is for the Irish cross-channel service, carrying passengers and general cargo. Another is for a high-class passenger and cargo steamer for trading on the East African coast in connection with the Government service, while another is a special steamer for protective service in the North of Scotland. The fourth of the vessels on hand is a high-class ocean-going steam yacht, and the fifth is a repeat of four steamers this Company have built for the Straits Steamship Company of Singapore.

Leith Graving Docks.—It has been remitted to the Works Committee of the Leith Dock Commission to consider and report as to the advisability of now proceeding with the completion of the proposed new dry dock, and, in view of the increased size of vessels now frequenting the port, to obtain a report from the superintendents as to the maximum dimensions which the present site will admit of. The size of vessels is constantly increasing and Leith has for some time laboured under the disadvantage of being without a dock to accommodate large vessels from the Black Sea and Mediterranean, which did not frequent the port a few years ago. At present, all through the country, it is contended there is a great number of unemployed people, and every corporation is doing what it can to provide work for that class. Labour in the circumstances can be got at the lowest possible rate.

THE TYNE.

(*From our Own Correspondent.*)

A Hint of the Unexpected.—There seems to be little doubt that the downward movement in shipbuilding, which has now been going on for more than a year, has been arrested, but whether momentarily or otherwise remains to be seen. Certain it is that enquiries for new tonnage have suddenly become more numerous, and that these are not the results of a mere desire among owners to sound the depths of builders' complacency, in these hard times, is shown by the fact that a number of orders have been placed. In view of the recent strikes in the shipbuilding trade, it was hardly to be expected that the North-east coast district would have been among the first to feel the touch of improvement, when such a phenomenon showed signs of appearing; but it cannot be gainsaid that throughout the district a more hopeful feeling has arisen, and it seems clear that there are some grounds for its existence. Orders have been placed at all the centres; but Sunderland, where they are undoubtedly most needed, has been the most fortunate in this respect. The reduction in shipbuilding operatives' wages and the prospective reduction in engineers' wages have apparently enabled shipbuilders to cut their quotations for tonnage very fine, and the exceptionally low prices submitted have had their natural effect in inducing enterprising owners to order new boats, even though some of their old ones may possibly be laid up. The conclusion seems to have been arrived at generally in business circles that strikes will not be resorted to so recklessly in the future, and that the possibility of such interruptions to work need not now be regarded with foreboding

in the making of contracts. For this salutory change nothing but the employers' firmness is responsible: had the men's long struggle against a necessary wages reduction resulted in success or in partial success, then there would be good-bye to peace in the North-east coast shipbuilding centres, and good-bye also to prosperity.

The Palmers' Co.—It is understood that this company has secured some further Government work, and it is also stated that orders for mercantile work have been placed. There is still much unemployment in the town of Jarrow, but it is hoped that before the winter sets in an increase of work in the Palmers' yard will absorb a large share of the idle labour. The Commercial Dry Dock Co. are also extending their resources, and the outlook at this company's establishment is excellent.

Messrs. Armstrong, Whitworth & Co.—This company have just launched from their Elswick yard a battleship for the Brazilian Government which is understood to be the largest war vessel afloat. The company have still a considerable amount of work in hand at the Elswick establishment, but business at the Low Walker yard does not seem to improve.

Messrs. Swan, Hunter & Wigham Richardson.—This company have recently launched a "Hansa" liner, which circumstance is indicative of sustained confidence on the part of the owners in the capabilities of the famous Tyneside firm to supply a superior ship, and within the contract limit. It is this reputation for promptitude in delivery, as well as reliable workmanship, that has to be maintained, and it is devoutly to be hoped that it will not again be jeopardized by the occurrence of unnecessary labour disputes. Among recent contracts obtained by the firm is one for the building of a powerful towing steamer, to be employed chiefly, it is said, in the towing of pontoon docks, etc., to distant places. The Smiths Dock Co. are about to enter upon the making of another large graving dock at North Shields, and expect to be shortly in a position for the removal of their shipbuilding department to the site prepared for it at Middlesbrough. The other ship-repairing firms at Shields seem to be having more work to deal with, this change for the better having been brought about apparently by the more settled condition of affairs as regards labour.

Work in the Engine Shops.—In the larger engineering works quietude still prevails, but there will doubtless be more stir now the expected settlement has taken place. Messrs. Parsons' turbine works at Wallsend appear to be busy, and the works of the same firm at Heaton also seem to be well employed. Messrs. H. Watson & Sons' works at Walker Gate continue to be kept briskly going in most of the departments, and other engineering establishments in the same locality appear to be doing moderately well. The electrical works of Messrs. J. H. Holmes & Co., Portland Road, are kept well employed, the contracts in hand being fairly numerous.

Gateshead.—Considering the dull state of business in shipbuilding, the aspect of affairs at Messrs. Clark, Chapman and Co.'s extensive works is satisfactory, most of the departments maintaining a fair show of work, whilst some are quite active. Messrs. E. Scott & Mountains, Close Works, are still busy in the electrical equipment of collieries, of which description of work the firm have made a speciality. The old-established works of Messrs. John Abbot & Co. are not at present showing much briskness in any of the departments, but the outlook is clearing, and it is hoped there will soon be greater scope for the employment of men. Messrs. Holzapfel's factory at Heworth Shore, where the firm's well-known paint compositions for ships are manufactured, appears to be busy in all departments, and the output is larger than ever.

THE WEAR.

(From our Own Correspondent.)

The Wear Commissioners.—A conference of an informal character recently took place between representatives of the Wear Commissioners and the Corporation, the object of which was to interchange views with respect to the possibility of improving the trade of the port. The Commissioners have already done much with this purpose in view, as witness the coal shipping facilities provided at the South Dock in recent years, the larger water area also made available, the new outlet and the magnificent north and south piers, which, when completed, will form a unique harbourage for ships. It would seem that not much more can be done, but it is as well that the local authorities should confer upon the matter, and something further may perhaps be evolved from their deliberations. It is stated that as a result of the conference a book is now being prepared for publication which will set forth the advantages of the port, not only to shipping people, but also to manufacturers wanting sites for new works. This effort at more effectually advertising the port cannot fail to do good, and will in all probability more than repay whatever outlay may be involved.

Shipbuilding.—We are informed that Messrs. J. L. Thompson & Sons have started a night shift at the frame-bending furnaces of their North Sands yard, and are having large deliveries of material made daily. This bodes well for the winter's work, and it is to be hoped that the good augury will be fulfilled. The Sunderland Shipbuilding Co. are reported to have booked further work, and it is also stated that an order for a vessel has been secured by Messrs. Priestman. Messrs. Short Brothers have three vessels on the stocks and five others in the preparatory stages, and so far as can be judged a busy winter in this case is assured.

The Bridge Dock repairing works of Messrs. Robert Thompson & Sons have been very busy for some weeks past, several vessels having received overhauls in the time. The firm's copper-smithing and brass-finishing shops have also been kept busy. The firm's shipyard at Southwick has all its berths occupied, the vessels in progress being of a superior class.

Engineering.—A couple of vessels have been engined at the Palmers' Hill Works during the month, and the outlook appears to have improved somewhat. The North-Eastern Works, South Dock, still keep busy, and at other works the state of affairs is unchanged.

In accordance with an arrangement arrived at between representatives of the federated employers and representatives of the societies concerned in the late strike, such men as room could be found for have been started at the various works, and in each case a more animated appearance is now presented.

THAMES.

(From our Own Correspondent.)

Surrey Commercial Dock Report.—This Company at its ordinary meeting held on September 10th, declared an interim dividend for the six months of 4 per cent. per annum on the preference stock and the usual dividend of 3 per cent. on all other preference stocks, but in view of the provisions of the Port of London Bill, the directors do not propose payment at present until the accounts are presented according to the provisions of the Bill, when a final distribution of profits will have to be made. In moving the adoption of the report, it was said there was an increase in tonnage of all classes entering the Docks of 45,494 tons and though there has been a decrease in wood tonnage in previous years, there has been now a great increase in wood landed and stored on the premises. The grain tonnage also showed an increase. It is in miscellaneous where the decrease has been and to some extent in coal. The position of this Company will therefore be seen to be very satisfactory on the eve of transfer, when this comes about, which seems likely.

Port of London Bill.—There are still dissenting opinions as to the utility of this measure. From a statement before us it is shown that the trade of the Port has progressed continuously from 1894 to 1906, that is to say, from 19,718,770 tons to 27,145,000 tons. The goods carried, it is pointed out, come and go free, except for the recent toll imposed by the Thames Conservancy Act of 1905 of £135,000, whereas if the bill becomes law, there will be an additional taxation of over £2,000,000 per annum, and this, it is said, will tend to strangle the trade of the Port instead of improving it, as it is put forward to do. These expressions have been rather strongly heard of late and whether they will be powerful enough to affect the settlement of the question, which is shortly to be brought before Parliament, remains to be seen.

Marine Engineering on Thames Side.—An echo of the process of elimination going on in this respect is noted in the

sale of plant, recently announced, of the well-known firm of Humphrey & Tennant's, of Deptford, for September 22nd and following days. All classes of machinery are represented as being offered, together with stores of every description. We mention the matter as showing the trend of events.

Orient Steamship Co.—Of the boats being built by this Company for the purposes of the new Commonwealth contract, the first is to be called the *Otway*, from a promontory of the same name on the Victorian coast. The five vessels building are all of 12,000 tons each.

The P. & O. Company.—This Company have recently issued a new edition of their pocket book. This work is a complete compendium of the Company's doings and contains sixteen illustrations in colours and numerous maps, with descriptive articles. The chairman refers to the Company as the most costly single fleet under British ownership, embracing as it does upwards of 400,000 tons. The directions to pursers as regards the efficiency of their catering show the signs of the time in a department which cannot receive too much attention.

Thames Conservancy.—It is perhaps opportune to consider the position of this body in view of proposed legislation. At present there are thirty-eight members, fourteen of which are made up of Admiralty two, Board of Trade two, Trinity House two, shipowners three, owners of barges two, dock-owners one, wharfinger one, West Ham one. By the proposed Bill, the Thames Conservancy will be merged in the Port Authority and a new Upper River Conservancy is to be established, starting from Teddington. The lower river, or Port, will therefore begin at this point also.

Death of Sir Edward Birkbeck.—The late Baronet was closely identified with the Royal National Lifeboat Institution, of which he was chairman, and in many other ways with sea-faring matters. His name was prominently associated with fisheries, and he was the leading spirit of the Fisheries' Exhibition, held in London, the King, then Prince of Wales, presenting him with a service of plate at the Fishmonger Hall, in October, 1885, which was subscribed for by fishermen boat owners, by whom the late baronet was so esteemed.

The Institute of Metals.—This new institution has appointed its secretary and the autumn meeting, its first, is to be held in Birmingham. The president of the Institute, as we have already mentioned, is Sir W. White, so we may rest assured success is certain of attainment for the new body.

Dover as a Port.—It will be remembered that the Hamburg-Amerika line formerly used this port for calling, and now the harbour is finished it is believed that a visit of the Director-General portends that the Port will be used again for this line. At least that is the result hoped for at Dover.

NORTH-WEST OF ENGLAND.

(*From our Own Correspondent.*)

State of Trade.—The gradual recovery of the shipbuilding trade has not been felt in Barrow yet. It is hardly likely that it will for a time, owing to the fact that the class of work in which Vickers' Company specialize is of the large type, and there is not much of that in the market. They have been estimating for several large vessels, including some for Russia, but for certain reasons which it is not necessary to discuss here, they are not likely to come to Barrow. Nothing has been heard of the Spanish work for which Vickers', Armstrong's and Thornycroft's are collectively tendering, but some people are of the opinion that such a combine will be very hard to beat. There are two things about this Spanish work which are a drawback. As much of the work as possible will have to be done in Spain, and this, of course, takes some of the milk from the cocoanut. Already several of the heads have been over, presumably to look at certain docks where the orders, if secured, could be executed. Then again, in connection with such an order from such a country as Spain, some time must elapse before they make up their minds and then when they do that there is the money question, and this is a serious one, and may interfere with the work being gone on with for perhaps a considerable period. The money question might be so serious as to put off the work for years. More naval orders from the British Admiralty might be placed soon, but whether Barrow will share cannot be said. It is hardly likely they will put in for the destroyers. They specialize in bigger ships than these. There have been no new developments on the engineering side, but brisker work is expected in a few months, both in the marine and gun-fitting departments.

The "Rurik."—At last the Russian first-class cruiser *Rurik* has been taken over by the Russian Government, and has sailed for Libau. The last that was heard from her was a highly complimentary wireless telegram which praised Vickers' for the way in which they had done their work. The builders deserve all the compliments that Russia can shower upon them. This ship is a marvellous vessel, and the embodiment of up-to-date naval construction. Never before has a vessel been built under such conditions and circumstances. The Russians in theory are brilliant naval architects, and, as is well known, in theory it is possible to make things absolutely perfect. They may never have been experimented upon in actual practice, but the Russian theorist has decided upon a certain design, a new principle, an innovation, and it must be incorporated in this vessel. It is done and practice begins to make holes in theory, but the Russian theorist perseveres, the builder follows suit and in the end the *Rurik* becomes the property of Russia and they go away evidently satisfied. The opinions of certain gentlemen highly placed among this country's shipbuilders are that the *Rurik* is the most perfect and highly finished vessel that has ever been put into the water. Whatever this vessel may do in the future she has established records in her exhaustive trials—one might say exhausting—which will be hard to equal. Russia ought to be proud of her, and if her crew when she enters into commission, is as perfect as her huge self then she will be a model to the world.

The building of the *Rurik* has had one effect upon British builders. It will be a long time before another cruiser or battleship is built in this country for Russia. The Russian theorist terror would frighten the estimate up to an impossible figure. That country is seeking plans for vessels which are to be built in Russia, and Vickers' have been busy on them for some time. A German firm or two are also sending in competitive plans. A good price is to be paid for them, and the designers are to see the construction through and guarantee perfection according to contract designs. It was said some time ago that Vickers' were to do this work. Now Germany has stepped in. What will be the outcome it is difficult to say at the moment.

An Ill-fated Elevator.—Not long ago Vickers' completed a pontoon for the firm of Appleby's, the large crane builders. On the pontoon was erected a cantilever crane which could also be used as a grain elevator. The crane was partly erected and the rest of it was securely fastened to the crane and deck. The London tug *Oceana* took her out a few weeks ago with the intention of towing her to Canada. Very heavy weather was experienced and when little over a hundred miles from North of Ireland there came disaster. The three men on board the elevator were washed overboard and were with difficulty rescued. There must have been some terrific seas, for this pontoon completely turned turtle, and at the moment of writing is floating abandoned in the lone Atlantic, the tug having returned to port. What will be done it is impossible to say at the moment, but it is almost certain that the matter will be placed in the hands of a salvage firm. A huge thing like this floating about the Atlantic with scarcely a freeboard is a serious menace to shipping.

The "Dreadnoughts."—Work on the British and Brazilian "Dreadnoughts" *Vanguard* and *St. Paulo* respectively is progressing. The *Vanguard* is putting on considerable weight and may be seen to be almost as heavy as her sister ship the *St. Vincent*, which was launched the other week. The date for launching will be fixed in a week or so. The armour for the *Vanguard* is beginning to arrive, and this is a sign that a few months at the most will see her in the water. The *St. Paulo* will be launched about the same time. She could be launched now, for she is well advanced, but there is the widening of the Buccleuch Dock passage way to complete yet, but that should not take long now. The 150-ton crane at the new wharf, where these two vessels will lie, will be ready for testing in the course of a few weeks.

The Transporter.—The press have been busy this month reporting and photographing the transporter which was submerged in a Liverpool dry dock and had two submarines for the Japanese Navy floated on to her. This vessel was

originally named the *Gemini*, but after having the name on her bows for two or three days a painter covered it over and the "heavenly twins" became the smug *[illegible]*. The latter name was certainly more in keeping with the character of the vessel, which some people erroneously described as looking like a hopper. She is of the type of vessel we see hundreds of, namely, a long series of hatchways, three masts and with engines aft. Her deck was riveted down, and she sailed at the end of last month. The passage will take about sixty or seventy days. There are rumours that Japan is ordering more submarines. Nothing is known as yet, nor will there be if Japan can have its own way. They are very secretive about their work.

The Old "Dreadnought."—The breakers-up are busy on the old *Dreadnought*. A lot of material has already been got away. When this vessel lifts to about a 15-ft. draught she will be towed to Preston, where the breaking up will be completed.

Submarines.—There is every indication that Vickers' are in for a very busy time with the construction of submarine boats, and rumours are afloat that several navies are after them. The "D1" is quietly and secretly being completed. Only the top of her can be seen and it is impossible to say how long this experimental vessel will be before she is ready for her trials. It was stated the other day that Holland, the American designer, who sold the British rights to Vickers', has designed a submarine that can cross the Atlantic. It may be that, before his design is perfected and his vessel built, Britain may have several that could cross the Atlantic—if they liked. It will not be an uncommon thing in a few years to hear of a submarine with sufficient fuel capacity to permit of a 2500-mile range. In a few years a battleship may boast of a few on her davits, seeing that "Dreadnoughts" are getting to such huge sizes.

Repair Work.—Vickers' are likely to have a fair amount of repair work this winter from the Isle of Man Steam Packet Company, whose fleet of passenger steamers, including the *Ben-my-Chree*, are beginning to arrive at their winter quarters at Barrow. The *Queen Victoria* went under the big crane on September 21st. As soon as the Buccleuch entrance is widened the *Empress Queen* will come through for an overhauling.

Hæmatites.—There is a welcome improvement in the hæmatite iron trade in the district. The enquiries are better and the price has lifted to 61s. per ton net f.o.b. for mixed numbers. Warrants have shown more life and then quietened down, but the price is now about 60s. per ton net cash. The steel trade is very dull indeed. The Barrow works are still closed, but Cammell's rail mills are restarting and are expecting to be engaged for the rest of the year.

Shipping.—Shipping has been dull and freights are still low. The exports of iron and steel from West Coast ports have been very small, and the aggregate for this year is 300,000 tons below the total for the corresponding period of 1907.

SOUTHAMPTON.

(From our Own Correspondent.)

Messrs. J. I. Thornycroft & Co., Ltd.—The torpedo boat destroyer *Amazon* carried out her steaming trial in the dock on the 15th Sept. last. The quarters for the installation of the wireless telegraph apparatus have also been completed.

First-class Torpedo Boat 31.—The machinery has been fitted aboard and the vessel was launched on the 24th Sept. last.

First-class Torpedo Boat No. 32.—The hull of this vessel is now complete, and the various water compartments have been water tested.

H.M.S. "Nubian."—The shell work and armour bulkheads on this destroyer are now completed.

Twin-screw Steamers for Argentine.—The first of the five steamers on order is now completed, and the launching ways are all laid. These vessels, on completion of their trials, will proceed to South America under their own power.

The repair department is busy with extensive boiler repairs and alterations to the Trinity House steamer *Satellite*, which is moored off the works; also to the Admiralty troopships *Plassy*, *Soudan* and *Dongola*. Coaling vessel C7 and Fisgards 1, 2, 3 and 4.

This firm have again been included in the list of firms asked to tender for torpedo boat destroyers, fourteen of which are included in this year's Navy estimates. In view of the splendid achievements of the *Tartar*, which was built and engined by them, their inclusion is natural. This announcement is good news for local men, and it is to be hoped that Messrs. Thornycroft will be successful in securing orders for two or three out of the fourteen, and thus be able to give employment to local men throughout the approaching winter. The special feature of the vessels will be their sea-going qualities, but the speed is not to exceed 27 knots at sea.

Messrs. Day, Summers & Co. are not very busy, but sundry repair jobs are in hand, including repairs to the paddle steamer *Queen*, which was damaged in the severe gale during the early part of last month.

The steamship *Courier* is undergoing survey, also sundry yacht work is in hand.

As indicative of the quick despatch which Messrs. Day, Summers can give, the following is of interest. A new H.P. piston, piston rod and cover were supplied and fitted in the short space of ten days for the steamer *Philadelphia*, the diameter of the H.P. cylinder being 25 in. and stroke 48 in.

Work is also proceeding on a large set of slipway hauling-up machinery which we hope to illustrate at an early date.

The Parsons Motor Co.—The racing boat *Wolseley Siddeley* has been fitted with a special type of Parsons reverse gear, also a standard pattern gear of similar type and a clutch have been supplied for the Daimler racing boat.

The following orders are going through the works. A 21-H.P. engine and propeller set and a 21-H.P. engine and dynamo coupled for Siam, also a 21-H.P. engine and propeller set for Australia. Work is also proceeding on a 14-H.P. engine and 7-H.P. engine, both for direct coupling to dynamos. The latter, we understand, will be exhibited at the Manchester Exhibition. The 40-ft. cruiser *Lurline* has had a 28-H.P. Parsons motor and propeller set installed and has been handed over.

The 100-H.P. engine, which we fully illustrated and described last month, is now installed on the *Orelia*, owned by C. Wilson, Esq., Hull. The racing boat *Sea Dog* has also had a good deal of work done to engine, etc.

HULL.

(From our Own Correspondent.)

With regard to general matters in the Port of Hull, business appears to be moving freely at the present time, there seemingly being a great deal of tonnage both entering and leaving the Port. There have been, during the past week or two, a large number of arrivals of steamers bringing grain to Hull, and coal exports are considerable, this being the time when frequent cargoes of coal are shipped to the Baltic and also the near Continental ports.

Shipping matters are principally mentioned here, but business generally is fairly good in the district—of course, considering the present state of trade all round.

The Hull Central Dry Dock and Engineering Co. are fairly well employed with repair work. Within the last few days they have booked a large repair job in the shape of supplying and fitting new cylinders and thoroughly overhauling other parts of the machinery and boilers of a large Liverpool steamer.

Cooper & Co., Engineers are very well off in the repairing line and have several good jobs in hand, they are also well employed in the foundry.

Amos & Smith, Marine and General Engineers, unfortunately are not very busy, trade is only very quiet with them, practically no orders are being placed for new machinery, and there is very little doing in ship repairs.

BELFAST.

(From our Own Correspondent.)

State of Trade.—The *Morning Post*, dealing recently in a series of articles with the want of employment in various parts of the United Kingdom, referred to the distress in Belfast. While the inevitable results of general trade depression

have to a considerable degree been felt in this city, some of the statements made by the writer in the *Morning Post* were decidedly exaggerated, particularly so those dealing with the number of inmates in the workhouse, and with the condition of the shipbuilding industry. "Statistics show," stated the writer, "that four times the usual number of people have during the past few months accepted the only alternative to slow starvation and applied for assistance. Moreover, workhouse officials tell of men and women who would a year ago have no more thought of seeking help from that quarter than committing suicide, creeping up to the Union gates at night and crossing the line dividing the pauper from the independent citizen." A local contemporary fitly characterized this as a piece of picturesque writing, but quite beside the mark as a statement of fact. The total number of inmates, according to the latest returns, is 3909, against 3284 last year, an increase of 625.

Referring to the shipbuilding trade, the *Morning Post* correspondent stated that 5000 of Messrs. Harland & Wolff's employés were out of work; whereas, as a matter of fact, the number of men paid off from time to time since the slackness first commenced has not exceeded a total of 2500. Hundreds of these have since been taken on again, and the full complement of hands will once more be required when the big orders which this firm has booked begin to take shape in the yards.

Messrs. Harland & Wolff.—On 10th September this firm launched from the south end of the yard the triple-screw steamer *Laurentic*, which has been built for the White Star Line's Canadian trade. The event was of special interest in view of the fact that the *Laurentic* is the first passenger steamer to have a combination of reciprocating and turbine engines, the two outside propellers being driven by four-crank balanced engines, and the centre propeller by a low-pressure turbine. Immediately after the launch of this vessel the keel was laid down in the vacated berth for a new steamer for the Australian United Steam Navigation Co., and on the stocks adjoining there is a large twin-screw steamer ready for putting in the water in a few weeks' time for the Atlantic Transport Co. It is reported that there is a prospect of the Hamburg-American liner *Oceana* being brought to the Queen's Island for extensive damage repairs, rendered necessary by the vessel's recent stranding in the Firth of Forth. The *Oceana* was formerly the well-known Union liner *Scot*, which was some years ago acquired by the Hamburg-Amerika Co. and converted into an ocean-going yacht by Messrs. Harland & Wolff.

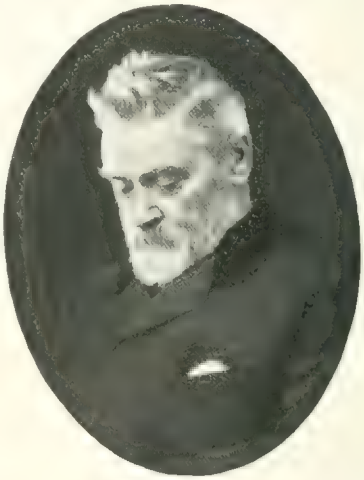
Messrs. Workman, Clark & Co.—This firm has put two new vessels of big tonnage in the water since last month's notes were written—the Holt liner *Theseus*, and the twin-screw steamer *Tainui* for the Shaw, Savill & Albion Co. The former vessel is 466 ft. long, with a gross tonnage of 6800, and is a sister ship of the *Perseus*, recently built by Messrs. Workman, Clark & Co. for the same owners. The *Tainui* is a vessel of 10,500 gross tonnage. On 27th August the new steamer *Heredia*, which is the third of a trio of vessels built by Messrs. Workman, Clark & Co. for the Tropical Fruit Steamship Co., Glasgow, underwent a successful series of trials on the Clyde, an average speed of 14¾ knots being attained. The new steamer is 393 ft. in length, with a gross tonnage of 5000. The propelling machinery is of the triple-expansion type, steam being supplied by five single-ended boilers working at 190 lbs. pressure under forced draught. About the same time the Holt liner *Perseus*, above referred to, also had a highly satisfactory trial trip. This firm has at present in hand for repairs the London steamer *Bramley*, which went ashore in the River Plate. The contract was secured in competition with six other firms, the tenders ranging from [illegible].

Ironmoulders' Wages.—The dispute raised by the employers' notice for a reduction of 2s. per week in wages has been settled without the threatened strike taking place. As a result of a recent conference between the representatives of the masters and of the Ironmoulders' Society a compromise was arrived at, the men agreeing to a reduction of a shilling a week.

New Graving Dock.—Good progress has for some time past been made with the construction of this dock. The pumping station is about to be started on, and it is expected that the dock will be completed in about ten or eleven months' time.

OBITUARY.

John A. Rowe.—The sad tidings of the death, at about sixty-six years of age, of Mr. J. A. Rowe, which took place at Finchley, London, N., on September 12th, has revived many memories, and among these occur the name of the late Mr. J. Macfarlane Gray, whom in January, 1897, he worthily succeeded in the office of Chief Examiner of Engineers, Board of Trade, and served in this capacity until failing health compelled his resignation, and the appointment of a successor—the late Mr. D. G. Watson, who died in 1905. The enforced retirement of Mr. Rowe was a source of great regret to those who were brought into personal intercourse with him. Born in Cornwall, in the neighbourhood of Falmouth, he received his training as an engineer and naval architect in the Government dockyard at Keyham. He then entered the Royal Navy, and served for fourteen years. In 1876, he was appointed Board of Trade Surveyor and was



JOHN A. ROWE

located on the north-east coast until his removal to the London district in 1889, where we were brought into personal contact with and learned to esteem him for the excellence of his characteristics and his unfailing courtesy, with consistent attention to the duties of his office. Shortly after coming to London, Mr. Rowe was elected a member of the Institute of Marine Engineers, of which he was afterwards elected a vice-president. He gave a paper on "Stability, and the motions of a vessel among waves," Part I. being read in the Town Hall, Stratford, in October, 1891, and in the University College, Cardiff, the following month. Part II. was read in the Gresham College, Basinghall Street, London, in January, 1892. At the subsequent discussion, which took place in the Town Hall, Stratford, the meeting was presided over by Mr., now Sir, Wm. H. White, Prof. Greenhill and the late Mr. Macfarlane Gray taking part. Broken health removed him for the past few years from the intercourse of most of his old friends and associates, whose memories recall many pleasant associations, and we respectfully offer to Mrs. Rowe and family our deep sympathy and regrets for the loss they have sustained.

MESSRS. DRAKE & GORHAM, LTD.—We have received catalogues from Messrs. Drake & Gorham, Ltd., of the Jandus arc lamps, which contain not only descriptions and illustrations of the various types, but also their lighting capacity. One catalogue entirely deals with the regenerative lamp which runs under the same conditions of voltage and current as the ordinary enclosed arc lamp. The carbons used in these lamps are chemically treated and are doubly enclosed. The hot gases and chemical vapours from the arc rise through the inner surrounding cylinder and pass down by side tubes to the base of the cylinder again and re-ascend past the arc so as to intensify its action. It is claimed that the cycle of operation is constantly going on and the chemicals are thereby used over again, this bringing about a regenerative action. It is stated that over ninety per cent. of the light is emitted by the arc at an expenditure of one watt for nearly five candle power, and further, one pair of carbons will last for seventy hours.

LAUNCHES AND TRIAL TRIPS.

LAUNCHES—English

Charleston.—On August [illegible]th, Messrs. Irvine's Shipbuilding and Dry Docks Co., Ltd., West Hartlepool, launched the handsome steel screw steamer, *Charleston*, built to the order of Messrs. Furness, Withy & Co., Ltd. She is of the following dimensions: [illegible] ft. [illegible] in. by [illegible] ft. [illegible] in., having single deck, poop, bridge and top-gallant forecastle, and has been built to the British Corporation Registry's highest class. A double bottom is fitted throughout on the cellular principle and the after peak is arranged as a trimming tank. She is constructed with bulb angle frames and longitudinal stringers, giving clear holds for the storage of bulky cargoes, and the bulwarks have been specially strengthened for the carriage of deck cargoes. Four watertight bulkheads divide the holds into five watertight compartments. She also has extra large cargo hatches, four steam winches, which are supplied with steam from a Cochran (Annan) donkey boiler with patent seamless furnace, and is replete with the latest improvements for rapid loading and discharging. A powerful quick-warping steam windlass is fitted forward for the working of the cables and steam-steering gear is fitted amidships with hand-screw gear aft. Accommodation for captain and officers is arranged in poop, engineers in houses amidships, crew and firemen in forecastle. The cabins throughout have been heated with steam, and the sanitary, ventilating and lighting arrangements have received special attention and have been effected on the most approved lines. Triple-expansion engines are being supplied and fitted by Messrs. MacColl & Pollock, Sunderland, having cylinders 20½ in., 33 in., 54 in. by 36 in., two large S.E. boilers, 180 lbs. pressure. The christening ceremony was gracefully performed by Miss Brooks, and there were also present, Mrs. Lee, Mrs. Thompson, Sir Christopher Furness, M.P., Mr. and Mrs. S. W. Furness, Mr. Marmaduke Furness, J.P., Mr. H. J. Simpson (London), the Sheriff of Newcastle (Councillor Walter Lee), Mr. H. C. Furness, Mr. R. J. Thompson, Mr. Churchward, Mr. McDonald (British Corporation Survey), Mr. D. Balford, Mr. A. S. Purdon, and Mr. J. T. Harris.

Mercedes.—On August 29th, the above-named twin-screw steam yacht, which is being built at Dartmouth by Simpson, Strickland & Co., Ltd., for Monsieur E. Jellinek Mercedes, was successfully launched, and this boat is of interest as being one of the fastest yachts afloat. She is 136 ft. long over all, 15 ft. beam and 9 ft. deep and is built of steel, being galvanized below the water line. She will be rigged with two pole masts and leg of mutton sails, and will be about 140-tons yacht measurement. On deck, there will be a large deck-house containing wheel-house, deck saloon, lavatories, and galley, the top of this deck-house forming a navigating bridge. Below deck there is a forecastle for the crew, and cabins for the captain and officers forward, and aft, there are four state-rooms, saloon, pantry, bath room, lavatory, etc. The machinery consists of two sets of triple-expansion engines, and two water tube boilers, the estimated I.H.P. being about 1,900 collective, and the speed of the boat on a four hours' trial will be 25 miles per hour, with twenty-four hours' coal supply on board. The yacht is to be luxuriously fitted throughout, and will have electric light, search light, steam-steering gear, steam capstan, etc. The hull, engines and boilers are being built by the builders and this boat will be far the highest-powered craft that has ever been built in Dartmouth.

Papagaio and **Periquito.**—On August 29th, were successfully launched from the yard of Edward Finch & Co., Ltd., Chepstow, two steel towing lighters, *Papagaio* and *Periquito*, of the following dimensions: Length, 84 ft., breadth, 17 ft., depth, 6 ft., built to the order of the Amazon Steam Navigation Co., Ltd., London, under the supervision of Messrs. James Pollock, Sons & Co., Ltd. The lighters, after taking in coal at Penarth for ballast, will be towed by a "Booth" Line steamer to the River Amazon, where they will be used for the transport of rice in bulk. The hatchways are fitted with galvanized arched plate covers running on rollers, which form a waterproof covering for the perishable cargo. The lighters have been rigged for sailing and their outfit and finish are equal to those for large sea-going vessels.

Ganda.—On August 31st, Messrs. Short Bros., Ltd., launched from the shipbuilding establishment at Pallion, Sunderland, the s.s. *Ganda*, built to the order of Messrs. T. Nolson & Sons, for the Ghent Lloyd of Ghent. The vessel, which will take the highest class at Germanischer Lloyd, is 292 ft. in length, 41 ft. beam, and 20 ft. 7½ in. depth moulded, and will carry a cargo of 3,400 tons on a moderate draught of water. She is constructed on the deep frame principle, with one deck laid, cargo poop, extra large bridge, and top-gallant forecastle. Water ballast is provided for throughout the double bottom and in both fore and after peaks. Comfortable accommodation is provided for the captain, with saloon handsomely panelled in polished hardwood, and for the officers and engineers in houses on the bridge deck, the crew being berthed in forecastle. Five steam winches, steam windlass, steam-steering gear amidships, with rods and chains to quadrant and controlled from standards on upper and lower flying bridges, and hand-steering gear aft are fitted, all driven from a large donkey boiler fitted in stokehold. The propelling machinery is by the North-Eastern Marine Engineering Co., Ltd., Sunderland, and consists of engines with cylinders, 20½ in., 33 in., 55 in. diameter and a stroke of 36 in., driven by two multitubular boilers, working at 180 lbs. pressure. During construction, the hull and machinery have been under the supervision of Mr. P. J. Goetbloet, of Antwerp. The christening ceremony was gracefully performed by Mrs. Vogt, of Liverpool.

Shakespeare.—On August 31st, the steam fleeter *Shakespeare*, the last of four vessels of this class which Earle's Shipbuilding and Engineering Co., Ltd., Hull, have built for Messrs. Hellyer's Steam Fishing Co., Ltd., Hull was successfully launched.

Pilot.—On September 10th, a steam launch, built to the order of the Humber Conservancy Board, left the ways of Earle's Shipbuilding and Engineering Co., Ltd., Hull. The principal dimensions are: Length, 50 ft., breadth moulded 11 ft., depth moulded 6 ft. She has been constructed of steel under Lloyd's special survey for class 100 A1, yacht rules, and is intended for pilot service on the Humber. The vessel has a commodious upholstered cabin forward for the pilots, and a suitable space fitted up aft for the crew. Her mast and funnel have been arranged to hinge so that she can pass under bridges at high water, and she is fitted with towing hook and rail aft. The vessel is propelled by a set of compound engines, having cylinders 8 in. and 17 in. diameter, by 12 in. stroke, steam being supplied by a large single ended boiler working at 125 lbs. pressure. The vessel before entering the water was gracefully christened *Pilot* by Mrs. A. E. Butterfield, and afterwards had a short run up the river, which proved very satisfactory.

Wandle.—On September 10th, Messrs. William Dobson and Co. launched from their shipbuilding yard at Walker, a steel screw steamer, which they have built to the order of the Wandsworth and Putney Gas Light and Coke Co., of London, for their coal trade between the Tyne and Thames. The dimensions of the vessel are: Length between perpendiculars, 205 ft., breadth 32 ft., depth moulded, 16 ft. 9 ins., and the deadweight capacity is about 1,250 tons on a light draught of water. This steamer forms a new departure in the coasting coal trade of this country, having been built by arrangement with Sir Raylton Dixon & Co., on the Harroway and Dixon, John Priestman and Livingston and Sanderson patents, with top side water ballast tanks in addition to the usual double bottom tanks. This innovation is of especial interest in the London coal trade, where the vessel always returns in ballast, as the large amount of ballast provided renders these light voyages much more safe and expeditious. Nor do these tanks practically reduce the space devoted to cargo, as they are built in a space which is usually shut off from the holds by wing boards. Another advantage is that the topside tanks are taken off the tonnage of the vessel, making a very low net register, which is a matter of great importance to steamers which are in and out of port every few days. Wandsworth being so far up the river, there are a number of bridges to negotiate, and for this purpose the mast, funnel, etc., have all been arranged to lower and all deck fittings had to be constructed to come under a certain height. The machinery is being constructed by Messrs. J. P. Rennoldson & Sons, of South Shields, and is of the triple-expansion type, having cylinders, 17½ in., 28 in., 47 in. diameter by 33 in. stroke,

steam being supplied by an exceptionally large boiler, as the vessel is designed to travel at a high speed. The construction of the vessel has been supervised on behalf of the owners by Mr. Robert Eeles, of Newcastle, and before leaving the ways the ceremony of naming the steamer the *Wandle* was gracefully performed by Mrs. Eeles.

The Collector.—Lately, Messrs. J. T. Eltringham & Son launched this powerful twin-screw tug, which has been constructed to the order of James Pollock, Sons & Co., Ltd., of London. This tug has been specially designed by Messrs. Pollock's for working in restricted and shallow waters, and has many interesting features, teak decks, teak boats, officers' accommodation on deck, large bridge and other features for tropical work. This vessel will journey out to India under her own power.

LAUNCHES—Scotch.

Munich.—On August 25th, there was launched at Clydebank by Messrs. John Brown & Co., Ltd., the turbine steamer *Munich* for the Great Eastern Railway Company's service between Harwich and the Hook of Holland, and a sister ship to the *Copenhagen*, which was launched at Clydebank in October of last year. The new vessel, which is designed for the transport of passengers, mails and baggage, will have a speed of 20 knots. She is of about 2600 tons gross, and her principal dimensions are :—Length, over all, 343 ft. ; breadth moulded, 43 ft. ; depth to shelter deck, 26 ft. 6 in. She has been built to the requirements of the Board of Trade for their passenger certificate, and is of mild steel throughout, the scantlings being in excess of the requirements for vessels of her type. Accommodation is provided amidships on the lower, main and awning decks for 320 first-class passengers, and aft on the lower and main decks for 130 second-class. The first-class dining saloon is a large and handsome apartment on the lower deck. It occupies the full breadth of the vessel, with seats for 62 persons. A large smoking-room, which will be one of the features of the vessel, is situated on the awning deck. Under the shelter of the boat deck is a spacious promenade, part of which is intended for the use of first-class passengers. The propelling machinery, which has been constructed by the builders, consists of a set of Parsons steam turbines, comprising one high-pressure and two low-pressure, with two astern turbines fitted within the low-pressure turbine casings. Steam is supplied by five large single-ended boilers, which work on the closed stokehold system of forced draught. The vessel is fitted with all modern deck machinery. A complete equipment of electric lighting has been installed, and the ventilating and sanitary arrangements are up to date in all respects. Like her sister ship she will be rigged as a two-masted fore and aft schooner, and will be fitted up for wireless telegraphy. The naming ceremony was performed by Miss Lawson, daughter of Sir Arthur Tredgold Lawson, Bart., director of the Great Eastern Railway Company.

Dredger.—On August 29th, there was launched at Port Glasgow, by Messrs. Ferguson Brothers, a powerful bucket dredger, complete with machinery on board and steam up, for the Tees Conservancy Commissioners. The vessel is capable of dredging 800 tons per hour from a depth of 40 ft., and is fitted with compound engines, two marine boilers, two sets of triple-barrel mooring winches, improved hoisting gear, and a complete dredging outfit. She has been constructed under the direction of Mr. George J. Clarke, M.Inst.C.E., engineer for the Tees Conservancy.

Cargo Steamer.—On August 29th, there was launched at Aberdeen by Messrs. Alexander Hall & Co., Ltd., a cargo steamer for the firm of Messrs. Robert Rix & Sons, Hull. The following are the dimensions of the vessel :—Length, 125 ft. ; breadth, 21 ft. ; depth, 9 ft. 8 in. She will be fitted with compound surface-condensing engines to indicate 330 horse power, while the boiler will work at a pressure of 135 lb. per square inch.

Beulah.—On August 31st, the Clyde Shipbuilding and Engineering Co., Ltd., Port Glasgow, launched a steel screw steamer for the Australian coasting trade of The Wallarah Coal Co., of Sydney. The vessel is 210 ft. by 30 ft. 4 in. by 15 ft. 6 in., and has been constructed to Lloyd's highest class, under the superintendence of Mr. Shanks, of London, and Captain Ilbury, of Glasgow. The vessel was named *Beulah* by Miss Mavor, and immediately after the launch was placed in the company's dock to receive her machinery, which has also been constructed by the builders.

Merchant.—On September 1st, there was launched at Scotstoun, by Messrs. Charles Connell & Co., Ltd., the steel screw steamer *Merchant*, which they have built to the order of Messrs. Thomas and James Harrison, Liverpool. The vessel, which has been constructed to Lloyd's highest class, has a carrying capacity of about 5900 tons, and is fitted with all the necessary appliances for the rapid and efficient working of cargo. Triple-expansion engines with all the latest improvements are being supplied by Messrs. Dunsmuir and Jackson, Ltd., Govan.

Piauhy.—On September 7th, there was launched at Glasgow, by Messrs. Yarrow & Co., the *Piauhy*, the second of the ten torpedo boat destroyers building for the Brazilian Government. The naming ceremony was performed by Senhora Burlamaqui, wife of Captain Burlamaqui, in the presence of His Excellency Admiral Duarte Huet de Bacellar, chief of the Brazilian Naval Commission ; Captain Almeida, chief of naval construction ; Lieutenant-Commander Godofredo Silva and other officers of the Brazilian Navy, including Captain Frontin, who will command the vessel. The dimensions of the *Piauhy* are :—Length, 240 ft. ; and beam, 23 ft. 6 in. She is fitted with two sets of triple-expansion four-cylinder engines balanced on the Yarrow, Schlick and Tweedy system, and two double-ended Yarrow boilers, each boiler being of about 4000 h.p.

Waratah.—On September 12th, there was launched at Whiteinch, by Messrs. Barclay, Curle & Co., the new steamer *Waratah*, the latest addition to the large fleet of Messrs. W. Lund & Sons, and one of a class specially designed for the Blue Anchor Line. In her combination of speed and luxurious passenger accommodation with large carrying capacity she is one of the best of the many types of vessels in the Australian service. She is 480 ft. in length over all, 59 ft. 3 in. in breadth, 39 ft. 4 in. in depth, and of 10,000 tons gross. She will carry 130 first-class passengers and 300 second-class. She has been built to the highest class in Lloyd's, and has three complete decks—lower, main and spar—with steel poop, bridge and forecastle decks. The first-class accommodation occupies the bridge, promenade and boat decks. The cabins are large and airy, and each has either a window or a port-hole, while several have two port-holes. The first-class dining saloon, at the fore end of the bridge deck, extends almost the full width of the vessel. It is lighted by large circular windows on three sides and by a large dome above. The first-class entrance hall and drawing-room are on the promenade deck. The first-class smoking-room is on the boat deck. One of the features of the vessel is a nursery, the first to be provided on a ship in the Australian service. The third-class accommodation in the poop, is of a very superior description. It includes a dining saloon extending the full width of the ship, a smoking-room and a ladies' lounge. Large refrigerating rooms are fitted on the main deck for the carriage of about 200,000 cubic feet of frozen produce. The machinery, which has been constructed by the builders, consists of two sets of quadruple-expansion engines, designed to maintain a speed of $13\frac{1}{2}$ knots. Messrs. Wailes, Dove & Co.'s bitumastic covering was applied to the tank top in boiler-room and deck in refrigerating engine-room and their bitumastic enamel to the boiler-room tank. The steamer has been constructed under the superintendence of Captain Ilbery and Mr. James Shanks, superintending engineer of the Blue Anchor Line, and was named *Waratah* (after the emblematic flower of New South Wales) by Mrs. Taverner, wife of the Agent-General for Victoria.

Kalu.—On September 14th, Messrs. Wm. Simons & Co., Ltd., Renfrew, launched from their yard the *Kalu*, the second of two very large and powerful suction and discharging dredgers, which they have constructed to the order of the Bombay Port Trust. These dredgers were built under the direction of Sir J. Wolfe Barry, and Mr. A. J. Barry, London, consulting engineers to the Bombay Port Trust, Mr. George Turner being resident inspecting engineer. The *Kalu*, with its sister ship the *Jinga*, which left the Clyde on the voyage to India, under its own steam, on September 12th, will be

oak, and the floor parquetry. The saloon extends the whole width of the vessel and will have seating accommodation for 160. It will have the popular "well" arrangement overhead, with verandah for the bandstand. The first-class lounge on the upper promenade deck will be in Louis XV. style, artistically panelled in oak, parquetry floor. The reading room on the same deck will be in white in the style after Adam Bros. This room will also have a parquetry floor. The first-class smoke-room on the upper promenade deck will be decorated with embossed leather and handsomely carved framework round the windows. The furniture will be of mahogany, and the floor india-rubber tiles. There is an electric passenger elevator serving four decks. The second-class state-rooms are on the sheltered deck, the saloon on the middle deck—a very fine apartment extending the whole width of the ship and to seat 262. The second-class library is on the lower promenade deck, and the smoke-room on the upper promenade deck—both elegant apartments, tastefully decorated in polished hardwood. The second-class passengers on this vessel will find the provision made for their comfort second to none on the Atlantic. The third-class dining room, which is aft on the upper deck, is also an exceptionally good room, extending the whole width of the ship. The promenading spaces on this vessel will form a special attraction, the fullest advantage being taken of the vessel's size to provide the pleasurable recreation so much enjoyed by Atlantic voyagers. The vessel will be fitted up with the latest and most improved Marconi system of wireless telegraphy, and will also have a submarine signalling apparatus.

TRIAL TRIPS.

Elcho.—On August 25th, the new steam trawler *Elcho* (of which we gave particulars in our September issue, page 62), built by Messrs. Hawthorns & Co., Ltd., Leith, for the General Steam Fishing Co., Ltd., Granton, ran trials on the Firth of Forth. There was a numerous company on board, including the directors of the fishing company. The owners' representatives were fully satisfied with the working of the machinery and the speed attained.

Heredia.—On August 27th, this new steamer, the third of a trio of vessels built by Messrs. Workman, Clark & Co., Ltd., Belfast, to the order of the Tropical Fruit Steamship Co., Ltd., Glasgow (Messrs. Clark & Service, managers), left Belfast Harbour, and after adjustment of compasses in Belfast Lough steamed across to Glasgow, where she took on board bunker coals and stores. On the following morning the *Heredia* proceeded down the Clyde to Skelmorlie, where she underwent her speed trials, which comprised a series of runs on the measured mile course and extended runs between the Cloch and Cumbrae lights. While these trials were in progress the auxiliary machinery was also submitted to working tests, and under all conditions the vessel and her equipment gave the utmost satisfaction, the average speed attained being 14¾ knots. The *Heredia* is a handsomely modelled vessel and presents the smart appearance of a cruising yacht, a resemblance which is intensified as you wander through the tastefully designed and furnished apartments, and note how carefully every detail seems to have been considered to ensure the safety and pleasure of the passengers during the voyage, the arrangements being made with a view to securing the utmost comfort of the passengers in a tropical climate. The owners are to be commended for their far-seeing enterprise in adding to their fleet such a handsome vessel. The new steamer is 393 ft. in length with a gross tonnage of 5000 tons, and she has been built under the special survey of the British Corporation Register for the highest class (R.B.S.*) in their registry; she also fulfils the requirements of the British Board of Trade and the United States Steamship Inspection Service for a first-class passenger steamer. The passenger accommodation is arranged on three decks amidships, the state-rooms being placed on the upper deck; the dining saloon, entrance hall, deck cabins and smoke-room on the bridge deck, and the music-room, lounge and *cabines de luxe* on the promenade deck. The dining saloon is well lighted by large windows in the sides and by a centre well surmounted by an artistic stained-glass dome; seating accommodation for ninety persons is provided at small tables. The furnishings and decorations of the dining saloon, music-room, smoke-room, lounges and special cabins are of exquisite design and are luxuriously furnished. The state-rooms, arranged to accommodate one, two or three persons, are all commodious apartments and, like the corridors, are finished in white enamel which presents a bright, cool and refreshing appearance. The two extremes of climates in which the vessel will trade have been provided against by the installation, in all the public rooms and state-rooms, of an efficient arrangement of steam heating, for use in cold weather, and an unique system of coolers for use in hot weather, these appliances being under the control of the occupants of the several rooms. Spacious and well-sheltered spaces are available for deck games and promenading on the bridge and promenade decks. A purser's office and enquiry bureau, placed in the main alley way, and a wireless telegraph-room fitted with the most approved instruments will be available at all times for the convenience of passengers. The lavatory accommodation is of the most satisfactory nature, comprising plunge and needle spray baths with hot and cold water supplies. The fresh-water supply has received special attention, the water being carefully filtered before it passes into the service pipes, while a drinking fountain with iced water laid on is fitted in the main entrance hall. The cargo compartments, six in number, have been carefully insulated and prepared for the carriage of fruit in bulk, and are capable of receiving 70,000 bunches of bananas. A large space in the after 'tween decks has been insulated and fitted up for the storage and preservation of the perishable stores and provisions required for consumption during the voyage. The refrigerating plant in conjunction with the cooler rooms, stores and room coolers is on the carbonic anhydride or CO_2 system, and is of the most efficient character. The electric light installation is of the most complete description, the current being obtained from four turbo-generating sets. The propelling machinery consists of a set of triple-expansion engines of the most improved type, the main condenser of which has a very large cooling surface. The auxiliary machinery, of the latest type, is placed in the main engine-room, and is thus under the direct control of the engineer in charge. Steam is obtained from five single-ended multitubular boilers working at a pressure of 190 lbs. under forced draught.

Papelera.—On August 28th, Messrs. Osbourne, Graham and Co. sent to sea for her official trial the steel screw steamer *Papelera* ((of which we gave particulars in our August issue, page 27), constructed to the order of Messrs. Fearnley and Eger, of Christiania. Engines have been supplied by Messrs. Geo. Clark, Ltd., Southwick Engine Works, Sunderland, and during the trial, which was very satisfactory, a speed considerably over the contract requirements was easily attained. After the trial the vessel returned to the South Dock, to load for her first voyage, under the command of Captain Evensen. During construction the hull and engines have been supervised by Messrs. Foss and Waitz.

Perseus.—The well-known fleet of steamers owned by the Ocean Steamship Co., Ltd., of Liverpool, has been further increased by the addition of two large steamers built by Messrs. Workman, Clark & Co., Ltd., of Belfast. The first of these vessels, the *Perseus*, left Belfast on August 28th, and after adjustment of compasses in the Carrick Roads, underwent her speed trials and auxiliary machinery tests, all of which were successfully carried out, an average speed of 14¾ knots being attained on a succession of runs over the measured mile course. The *Perseus* is the seventeenth vessel built by the above firm for the Ocean Steamship Co.'s fleet, and is 460 ft. in length with a gross tonnage of 6800; she has been specially designed and equipped for her owners' service to the ports of the Far East. The construction of the vessel is on the fore and aft girder principle, thus securing the maximum of unobstructed space inthe cargo holds, which are therefore capable of accommodating exceptionally large consignments. The cargo space is divided into four large compartments and two smaller ones, which are also arranged for use as deep water ballast tanks. Each of these compartments is furnished with a large hatchway and each hatchway is efficiently equipped with powerful steam winches, suitable derricks and other special appliances necessary for successfully dealing with a complete general cargo. Accommodation is provided

in state rooms on the boat deck for a number of saloon passengers and in the forecastle for steerage passengers, while the space at the after end of the main deck has been arranged for the accommodation of emigrants. Separate galleys and lavatories are provided for each of these classes of passengers, while the ventilation of all the passenger accommodation has been carefully attended to, so as to ensure the utmost comfort in the hot climate in which the vessel will trade. In the saloon passengers' and officers' rooms an efficient heating installation on the hot-water system has been fitted so as to ensure the comfort of the persons occupying these rooms when the vessel is trading in the cooler latitudes. Electric lighting is provided throughout the vessel, the installation including powerful projectors to facilitate the passage through the Suez Canal. The machinery consists of a set of triple-expansion engines of the most improved type, having all the necessary auxiliary appliances and supplied with steam from two single-ended cylindrical multitubular boilers, an additional similar boiler being provided for supplying steam to the deck machinery.

Saxifrage.—On September 2nd, the trials of the rock-breaking hopper dredger *Saxifrage*, recently launched by Messrs. Fleming & Ferguson, Ltd., Paisley, were carried out, and were satisfactory in every way. The dredger has been constructed to the order of the Commissioners of Public Works in Ireland for carrying out improvements on various ports on the Irish coast.

Esneh.—On September 3rd, the steamship *Esneh*, built by Messrs. John Blumer & Co., North Dock, Sunderland, to the order of the Moss Steamship Co., Ltd., of Liverpool, ran a successful trial. Her dimensions are :—Length, 348 ft.; breadth, 47 ft.; depth, 26 ft. 6 in. The steamer is intended for the Mediterranean trade of her owners, and in addition to being fitted with every modern convenience for that trade, she has accommodation for a number of passengers, for whom a large and handsomely fitted saloon-house is placed amidships, with berths adjoining. The engineers and officers are accommodated in comfortable side houses at the after end of the bridge deck. The ship is fitted throughout with electric light, which has been installed by Messrs. H. T. Boothroyd, Hyslop & Co., Ltd., of Liverpool. The engines and boilers have been constructed by Messrs. John Dickinson and Sons, Ltd., of Palmer's Hill. The trial was most satisfactory in every respect, the ship attaining a mean speed of $11\frac{3}{4}$ knots. Mr. Wm. M. Moss and Mr. Walker Harding, of the firm of Messrs. James Moss & Co., were present on the run, and also Mr. John Esplen, of the firm of Messrs. Wm. Esplen and Sons, of Liverpool, under whose superintendence both ship and engines have been constructed. The vessel has been built under the Special Survey of the British Corporation Surveyors, and takes their highest class.

Lambare.—On September 4th, the new steamer *Lambare*, built by Messrs. A. & J. Inglis, Ltd., Pointhouse, for Mr. N. Mihanovich, of Buenos Ayres, completed satisfactorily a series of speed trials. The *Lambare* is a paddle steamer, 240 ft. long by 34 ft. beam, having two tiers of deck-houses (above the main deck), containing sleeping accommodation for 165 first-class, 42 second-class, and 69 third-class passengers. The dining saloon provides accommodation for 104 first-class passengers, and is panelled in Austrian oak and handsomely upholstered. Triple-expansion engines have been supplied by the builders. The draught of water, with 50 tons of coal in bunkers, is only 5 ft., so that the vessel is thus enabled to navigate the upper waters of the Parana.

Kinmount.—On September 5th, the new steamer *Kinmount* built by Messrs. Archd. McMillan & Son, Ltd., for service on the Canadian Lakes, ran trials on the Clyde. The vessel is of the single-deck type and is fitted for the handling of large quantities of cargo on the Canadian Lakes. The vessel and machinery (the latter being supplied by Messrs. Muir & Houston, Ltd., Glasgow) have been built to the highest class of the British Corporation. The *Kinmount* is the third vessel built by Messrs. McMillan for the same owners, and the seventh recently completed by them for Canadian service. On the completion of the trial, which was in every way satisfactory, the vessel proceeded on her voyage to Sydney.

Ibiapaba.—On September 9th, the steel screw steamer *Ibiapaba*, built by Messrs. Craig, Taylor & Co., Ltd., Stockton-on-Tees, to the order of Messrs. Lloyd Brazileiro, of Rio de Janeiro and London, was taken to sea for her trial trip, which proved highly satisfactory. The vessel is of the following dimensions, *viz.*, 286 ft. by 44 ft. 9 in. by 17 ft. 6 in. depth moulded. She is designed to suit the special trade of the Lloyd Brazileiro, and is of the single-deck type, with deck-houses amidships and forecastle forward, and is built under special survey to class with the British Corporation Registry. The vessel has double bottom for water ballast in the holds, and has also water ballast in the peaks. She is fitted with patent vertical steam windlass with quick-warping ends by Messrs. Clarke, Chapman ; Hastie's Wilson-Pirrie patent steam-steering gear, placed in house aft, and worked from bridge amidships by telemotor ; eight steam winches, double derricks for rapid loading and discharging, with gins and blocks having Reid's patent sheaves ; Clayton fire and disinfecting machinery ; electric light by Siemens Bros., and all modern improvements for a first-class cargo steamer for the Brazilian trade, including Wailes, Dove's patent bitumastic enamel to the tanks, Christie's patent sparring cleats, Litosilo to cabins, Hoskins' beds, whilst the lifeboats have Mills' disengaging gear. The machinery, which has been constructed by Messrs. Blair & Co., Ltd., Stockton-on-Tees, consists of two sets of triple-expansion engines 14 in., 22 in., 37 in. by 24 in., with two large steel boilers working at 185 lbs. pressure, and during the whole of the run worked with the greatest smoothness, when a speed of 11 knots was maintained. The vessel has been built under the superintendence of Mr. H. Hudson and Mr. T. Robinson, and these gentlemen, who were on the trial trip, expressed themselves as being highly pleased with the ship and engines. Captain Costa, who was also on board representing the owners, was highly pleased with the result of the trials.

Spreewald.—On September 12th, this fine passenger and cargo vessel (the second of three sister ships) to the order of Messrs. The Hamburg-Amerika Line, and just completed by Messrs. Furness, Withy & Co., Ltd., at their Middleton Shipyard, Hartlepool, proceeded on her trial trip. The vessel is a very fine example of naval architecture and the celebrated Hamburg-Amerika Company are to be complimented on their usual foresight in determining upon the most up-to-date class of vessel for the special trades in which they are engaged. The ship is beautifully fitted up and is specially adapted for carrying first-class passengers and better-class emigrants to and from the West Indies. Every provision has been made for the comfort of the passengers and emigrants, great care having been taken with the ventilation, electric fans being fitted in each passenger berth, saloon, ladies' room and smoke-room. The ship is well on to 400 feet in length and has two complete decks with long bridge, poop and forecastle. In the bridge amidships is fitted the accommodation for the first-class passengers, engineers, purser, stewards, stewardesses, etc., also the galley, bakery, baths, lavatories, etc. The main dining saloon, ladies' saloon, and smoke-room are situated in lofty houses on the bridge deck, and on top of the saloon house is a large teak house containing accommodation for the captain and officers. Above this is the chart and wheel-house, the top of this house being over 62 feet above the keel of the vessel. The 'tween decks all fore and aft are fitted up with galvanized iron berths for emigrants, all the necessary wash-houses, hospitals, shower baths, etc., being included. The vessel has two masts, and two derrick posts, and for dealing rapidly with general cargoes, there are eleven powerful steam winches, and seventeen patent tubular steel derricks, including two each of 15-tons capacity. Eight large boats are fitted on the boat deck, which extends the full length of the bridge amidships, these boats being carried on patent tubular davits. For carrying the necessary provisions, wines, etc., for passengers, a very elaborate arrangement of refrigerating machinery and provision rooms have been fitted up in the after end of the ship. The electric installation consists of two direct-coupled engines and dynamos, and over 300 electric lamps are distributed throughout the ship. A very powerful steam-steering gear (Sivewright's patent) is fitted in a large house on the poop, with telemotor gear to the captain's bridge amidships. The whole of the auxiliary machinery for this vessel has been manufactured at the Middleton Shipyard, Hartlepool. The engines, which are of the triple-

expansion type have been constructed by Messrs. Richardsons Westgarth & Co., Ltd., Hartlepool, and have cylinders 25 in., [illegible] in., 72 in. diameter with a stroke of [illegible] in. The high-pressure cylinder is fitted with a piston valve and the intermediate and low-pressure cylinders with balanced slide valves. All the shafting is ingot steel and the propeller shaft is covered with a continuous gun-metal liner. The propeller is of manganese bronze. For controlling the speed of the engines a governor is fitted and connected with the throttle valve. There is a Weir's contact feed-heater, and the engine-room auxiliaries are very complete, including general purpose, fresh-water and ballast pumps, feed-water filter, evaporator, etc. A novel feature in connection with the whistle is an electric gear adopted by the Hamburg-Amerika Company, by means of which the whistle can be automatically sounded at intervals. Steam is supplied to the main engines and auxiliaries by three single-ended boilers, 14 ft. diameter by 12 ft. long, working at a pressure of 200 lbs. per square inch, and arranged with Howden's system of forced draught. An ash ejector is fitted in the stokehold and an additional two-cylinder ash hoist. The machinery throughout is of very substantial and massive design. During a six hours' continuous full-speed run, the main engines, refrigerating plant and the whole of the auxiliary machinery worked most satisfactorily, the vessel attaining an average speed of 14 knots. The owners were represented by Mr. A. Rothardt and Mr. Viereck, the shipbuilders by Mr. H. Withy, and the engineers by Mr. L. D. Wingate and Mr. G. Urquhart, whilst Mr. W. J. B. Casley was present on behalf of the Germanischer Lloyd.

Elysia.—On September 14th, the new steamer *Elysia* (of which we gave particulars in our September issue, page 59), built by Messrs. David & William Henderson & Co., Ltd., Partick, for the Indian service of the Anchor Line, carried out her trial trip on the Firth of Clyde, when, on the invitation of the owners and builders, about fifty ladies and gentlemen were on board. After leaving Gourock, the vessel proceeded at once to the measured mile at Skelmorlie, where, on a double run, she attained a mean speed of 14 knots, the indicated horse power being 4000. The *Elysia* left Glasgow on her first voyage to Bombay on 24th September, and is commanded by Captain Haig, late of the *Circassia*.

Para.—On September 15th, the official trial of the destroyer *Para*, built for the Brazilian Government by Messrs. Yarrow & Co., Ltd., Glasgow, took place on the Firth of Clyde. A speed of 27¼ knots was attained during a continuous run of three hours, the vessel carrying a load of 100 tons.

Princess Charlotte.—On September 15th and 16th, the twin-screw steamer *Princess Charlotte*, built by the Fairfield Shipbuilding and Engineering Co., Ltd., Govan, for the Canadian Pacific Railway Company's service between Vancouver, B.C., and Seattle, Wash., ran trials on the Firth of Clyde. After adjusting compasses at the Tail of the Bank the vessel proceeded to the measured mile, where a series of progressive trials, varying in speeds from 12 knots to a maximum, was run. She was then put on a six-hours' trial at full speed, which proved most satisfactory, a mean speed of over 20 knots being easily attained. The Canadian Pacific Railway Company were represented on board during the trials by Captain Mowatt, marine superintendent, and the Fairfield Company by Mr. Alex. Gracie, managing director, Mr. A. W. Sampson and Mr. Cleghorn. The *Princess Charlotte* is of about 3600 tons gross, and has accommodation for a large number of passengers in beautifully fitted-up state-rooms and saloons. She has five decks—the orlop, main, shelter, promenade and shade decks—and is divided into seven water-tight compartments, the orlop decks also being water-tight to ensure additional safety to the vessel. The main entrance to the vessel is through water-tight doors in the ship's side on the shelter deck forward, which lead to a spacious entrance hall, tastefully panelled in polished teak, the floor being laid with terra cotta and white interlocking rubber tiles. Aft of the main entrance is a large central hall fitted up with handsome lounge seats. There is accommodation on the shelter deck for 176 first-class passengers in two and three-berth state-rooms. There are also twelve special three-berth rooms and four rooms fitted as bridal chambers. At the after-end of the shelter deck is a central hall similar to the one forward, and also a ladies' tea-room. On the promenade deck forward and aft are two spacious halls with open wells, which give light to shelter deck halls, and also accommodation for 104 first-class passengers in two-berth rooms furnished similar to the shelter-deck rooms. At the forward end is the observation room, which is a main feature in the vessel. Aft on the main deck is the dining saloon, which extends from side to side of the ship, and is capable of seating 133 persons. Forward on the main and shelter decks is accommodation for forty-eight second-class passengers, with smoking-room, bar and dining accommodation. The space amidships on main deck may be utilized for cargo or cattle, as required. The propelling machinery consists of two sets of inverted direct-acting triple-expansion engines, each set having four cylinders and four cranks, balanced on the Yarrow-Schlick and Tweedy systems.

Arapawa.—On September 16th, the screw steamer *Arapawa*, built by Messrs. John Fullarton & Co., Paisley, to the order of Mr. J. H. Williams, of Wellington, New Zealand, was tried for speed on the Firth of Clyde. The vessel, which is schooner-rigged, with raised quarter-deck, and has been constructed throughout under the special survey of Lloyd's and Board of Trade, is arranged for the transport of dairy produce, and is fitted with refrigerating plant and electric light. The driving machinery is of the triple-expansion type, and was supplied and fitted aboard by Messrs. Renfrew Brothers and Co., Irvine. It worked very smoothly throughout the day, and a mean speed of 9½ knots was attained over a four-hours' continuous run.

Makura.—On September 17th, the twin-screw steamer *Makura* (of which we gave particulars in our August issue, page 27), built by Messrs. Alex. Stephen & Sons, Linthouse, for the Union Steamship Co., of New Zealand, ran trials on the measured mile at Skelmorlie, attaining a mean speed of 17½ knots, and later in the afternoon started a twenty-four hours' run at the service speed of 16½ knots. She sailed from Glasgow on September 26th, carrying passengers for Cape Town, Durban and Melbourne. The builders of the *Makura* entertained a large company on board during the trials. Mr. A. E. Stephen, Mr. F. J. Stephen and Mr. Hunter, shipyard manager, represented the Linthouse firm, and Sir James Mills, chairman, and Mr. J. M. Ritchie, director, the Union Steamship Company

BOARD OF TRADE EXAMINATIONS.

Note—1C denotes First Class; 2C Second Class.

August 15th, 1908.

Barron, Leslie	2C	Hull
Black, George	2C	Greenock
Chapman, D'A	1C	London
Clouston, J.A.J.	1C	N Shields
Cochrane, Geo.	2C	Greenock
Coombe, John	1C	London
Cornish, J H M	1C	London
Cox, Charles F.	2C	Liverpool
Emerson, R H	2C	London
Frazer, Thos N	1C	Liverpool
Harle, Edward	2C	Liverpool
Hendry, Wm.	1C	Greenock
Hilliard, J R	2C	London
Legertwood, J	1C	Greenock
Mack, John W.	2C	Liverpool
Mackay, C M	2C	N.Shields
Morrison, Arch	2C	Greenock
Norman, Albert	1C	London
Page, James ..	2C	Dundee
Parker, Partis	2C	Liverpool
Ramsay, James	2C	Greenock
Randle, Samuel	1C	N Shields
Richardson, A.	1C	N.Shields
Smethurst, A...	2C	Liverpool
Stead, Horatio	1C	Liverpool
Stokoe, Miles B.	2C	N.Shields
Taylor, Duncan	2C	Greenock
Trotter, W. B.	2C	London
Venables, A. K.	1C	Hull
Walker, H P W.	2C	Greenock
Warnes, Robert	2C	N Shields
Whyte, John A.	1C	Dundee
Williams, R. T.	2C	Liverpool
Wilson, Cha . J	2C	N Shields

August 22nd.

Adams, Wm. R.	1C	Liverpool
Allen, Arthur R	2C	N Shields
Bagley, Andrew	2C	Cardiff
Barwick, Fredk.	2C	W. Hart'l
Bellman, W. H.	1C	Barrow
Black, Peter B.	2C	Glasgow
Bond, A. W. ..	2C	South'ton
Booth, Wm. H.	2C	W Hart'l
Braithwaite, G.	1C	Liverpool
Brazier, F. C. ..	1C	South'ton
Brown, Fred. J.	2C	London
Bruce, James ..	2C	London
Burgoine, H. W.	2C	London
Cameron, A. T.	2C	London
Carrey, Thomas	2C	Barrow
Clarke, Oscar ..	2C	Cardiff
Corner, Edw. S.	2C	W Hart'l
Court, M. O. ..	1C	Cardiff
Coverdale, H M.	2C	W. Hart'l
Cutler, Robert..	[illegible]C	South'ton
Dow, John	2C	Glasgow
Drummond, Jas	2C	Leith
Edwards, Fred	[illegible]C	Cardiff
Elliott, Wm. C.	1C	Liverpool
Farthing, N.H.J.	[illegible]C	N Shields

Forrest, Ed D	1C	N Shields
Gibson, A H ..	1C	Leith
Gilbert, John F.	2C	Liverpool
Gregory, T. C.	2C	W Hart'l
Hudson, John J	2C	N Shields
Hunter, P. H ..	1C	Glasgow
Jones, John	1C	Liverpool
Kaye, James ..	1C	Glasgow
[illegible]	2C	South'ton
Lewis, James ..	1C	Liverpool
Macdonald, J	2C	Leith
Marriott, J W.	2C	Glasgow
McDiarmid, P.C	2C	Leith
McFadyen, T.H	2C	W. Hart'l
Millar, John R.	2C	South'ton
Moss, George S.	2C	London
Ogden, Jos T.	2C	Liverpool
Penn, J. T. H.	2C	Leith
Pescod, William	2C	N Shields
Reid, A W. ..	1C	South'ton
Ridhalls, A. G.	2C	Plymouth
Roberts, W. E.	2C	Cardiff
Rogerson, Peter	1C	Liverpool
Scapens, Wm	2C	Liverpool
Sergeant, A. T.	2C	Liverpool
Shaw, David ..	1C	Glasgow
Shaw, John	2C	London
Shearer, S. E.	2C	Liverpool
Singleton, Alf.	2C	N.Shields
Spencer, W. L	1C	N.Shields
Stevens, C.H M.	2C	Cardiff
Swales, Arth. J	1C	W. Hart'l
Sweeting, W. R.	2C	W. Hart'l
Taylor, Syd R	2C	W Hart'l
Thubrun, T J.	2C	N Shields
Treloar, E. B...	1C	London
Trenoweth, S. B	2C	London
Walker, Jas. S	2C	Liverpool
Whyte, Alan ..	2C	Liverpool
Williams, Ed...	1C	Cardiff
Williams, W. O.	2C	Liverpool

August 29th.

Archer, H. W	2C	Hull
Ball, William S.	2C	Liverpool
Bambro, T. W.	2C	Sunderl'd
Browne, G. C.	1C	Liverpool
Burr, Bert F. ..	1C	Liverpool
Coleman, A. E.	1C	London
Corsar, James..	2C	Aberdeen
Dawkins, F. W.	1C	Liverpool
Dewsbury, W.G	1C	London
Donnan, Hugh	1C	Liverpool
Ellerington, J.C	1C	Sunderl'd
Fraser, Wm. H.	1C	Hull
Gibbins, J. W.	2C	Liverpool
Gittos, Wm H.	1C	Greenock
Hendry, Wm...	1C	Greenock
Hudson, Fredk	2C	Hull
Hughes, W. A.	2C	Liverpool
Irwing, George	2C	Sunderl'd
Jeffrey, William	2C	Sunderl'd
King Edw. V.	2C	London
Lendrum, G. B.	1C	Liverpool
Macnab, A. C.	2C	Liverpool
Mapstone, H. ..	2C	Sunderl'd
McLeod, Angus	2C	Greenock
Middlemiss, F.	1C	Hull
M'Kenzie, John	1C	London
M'Murray, S.F.	1C	Liverpool
Nield, William	2C	Liverpool
Park, Henry ..	2C	N Shields
Robinson, J. D.	2C	Liverpool
Robinson, S. W.	2C	N.Shields
Rogers, W P.	2C	Greenock
Ryland, Ed. T.	2C	Hull
Scott, Walter ..	1C	N.Shields
Simpson, A. E.	2C	Sunderl'd
Smeaton, James	1C	Aberdeen
Spence, A. F. ..	2C	N Shields
Stockwood, A.D.	2C	Bristol
Tod, William P.	2C	Aberdeen
Walker, R. A. B.	1C	N Shields
Wearing, Robt.	1C	Liverpool
Wharton, Albert	2C	Liverpool
Whatmore, Alf.	2C	London
Wilkie, Andrew	1C	Sunderl'd
Williams, Reg.	2C	Bristol
Woon, Spencer	2C	London
Wright, P. W.	1C	Sunderl'd

September 5th.

Andersen, J. A.	2C	Liverpool
Black, James K.	2C	Glasgow
Butler, Thos G.	2C	Liverpool
Byrne, Myles ..	1C	Liverpool
Calder, Norris E.	1C	Leith
Chappellow, L.	1C	N Shields
Cockell, A. G..	1C	London
Cole, George A	2C	N.Shields
Davey, Samuel	2C	Belfast
Dickinson, T.H.	2C	Liverpool
Ferguson, G. D.	2C	Liverpool
Francis, W R.	2C	Cardiff
Gillies, C M'G.	1C	Glasgow
Goldsbrough, W.	2C	N.Shields
Griffith, John ..	2C	Liverpool
Hackney, W. A.	1C	Belfast
Halliday, H. ..	2C	N.Shields
Harris, C. H. ..	2C	London
Harris, Samuel	2C	Glasgow
Hemmens, E H.	1C	London
Hodgson, Harry	2C	N.Shields
Houston, James	1C	Glasgow
Howison, R. M.	2C	Glasgow
Hynd, John ..	1C	South'ton
Inkester, J. E.	2C	Liverpool
Jones, J E. D.	1C	London
Jones, John L.	2C	Cardiff
Jones, Rich. O.	2C	South'ton
Kernan, C. J. ..	1C	South'ton
Kerr, John	1C	Glasgow
Kinnard, Daniel	2C	Liverpool
Klitz, H. H. ..	1C	South'ton
Lawson L. M.	1C	Liverpool
Lockhart, T. G.	1C	Belfast
MacIntyre, P.	2C	Glasgow
Marshall, John	1C	Glasgow
May, Lionel J.	2C	Falmouth
Maynard, F. F.	2C	London
M'Broon, James	1C	Glasgow
Mearns Alfred	1C	N Shields
Meiklejohn, C.	1C	London
Metcalfe, Harry	2C	N Shields
M'Kinney, Thos	2C	Liverpool
Orchard, Carlton	2C	Cardiff
Paterson, Robt.	2C	Glasgow
Penman, J. G ..	2C	Leith
Porter, Sid. E	2C	Liverpool
Rae, William ..	2C	Glasgow
Railton, G. E.	1C	Cardiff
Reid, William ..	2C	Glasgow
Robson, John ..	2C	South'ton
Scott, Geo. N.	1C	Glasgow
Scott, James ..	1C	Glasgow
Seaward, T. A.	1C	Cardiff
Smith, Edgar J.	2C	Cardiff
Smith, James ..	2C	N Shields
Thomas, D. J.	1C	Cardiff
Tucker, R. J. ..	2C	Falmouth
Tunstall, Fred	2C	N.Shields
Vasey, John C.	2C	N.Shields
Wade, Thos. J	1C	Cardiff

September 12th.

Armstrong, G.H.	1C	N.Shields
Bewley, Joshua	2C	Liverpool
Bond, John G.	2C	Liverpool
Caizley, R.A.O.	2C	N.Shields
Cramond, J. S	2C	Dundee
Dawson, John T.	1C	N.Shields
Dawson, Robert	2C	N.Shields
Dye, Charles ..	1C	London
Ellis, Percy J...	1C	London
Ewing, Alex. ..	1C	N.Shields
Forbes, Arthur	2C	Liverpool
Foxall, James ..	2C	N.Shields
Gardner, Henry	2C	Liverpool
Good, James H.	2C	Liverpool
Graham, B ..	2C	London
Green, Robt. C.	2C	Greenock
Hankinson, T.W.	1C	Liverpool
Hutchison, C.R.	1C	Dundee
Kennedy, Peter	1C	Dundee
King, Thomas..	1C	London
Livingston, Alex.	2C	Greenock
Macdougall, A	1C	Dundee
Malcolm, Thos.	2C	N.Shields
Martin, B. M.	2C	Greenock
Moir, Arch. B.	2C	Greenock
Newbold, S. L.	1C	N.Shields
Newham, Arthur	1C	Hull
Nisbet, Robert	2C	Liverpool
Parry, Thomas	1C	Liverpool
Pearson, Wm.	2C	Hull
Porteus, Wm...	1C	N.Shields
Prime, Edw. A.	1C	London
Reid, James ..	2C	Liverpool
Tate, Harold	2C	N.Shields
Thomas, M J.	2C	Liverpool
Wharton, F C.	1C	Hull

Congress of Refrigerating Industries.—The programme of events issued in connection with the International Congress of Refrigerating Industries to be held at Paris, is a most interesting one; and on reading it through, including —we are tempted to add—especially the latter portion containing illustrations of the places and districts to which visits are arranged, on the conclusion of the Congress, we cannot but realize that the walnuts and wine after the more substantial courses have been partaken of, will prove very agreeable and good aids to digestion. The Congress opens on Monday, October 5th, and closes on the 12th, after which follow the excursions which have been arranged for those members of the Congress who may have the leisure to devote to the pleasant after course, with a few days extra on French soil to strengthen the associations formed during the progress of the Congress and possibly aid in establishing a good understanding among the nations represented. The subjects to be dealt with are as follows:—Section I. Low temperatures and their general effects, under which papers are being prepared by Sir Wm. Ramsay, Dr. L. H. Groth, Dr. S. Rideal and Mr. C. J. Tabor. Section II.—Refrigerating appliances with papers by Messrs. Hal Williams, M. T. Brown, W. D. A. Bost, R. Stephen Ayling. Section III.—The application of refrigeration to food. Papers by Messrs. W. Preedy, S. Lowe, J. H. Geddes, O. J. Sölling. Section IV.—The application of refrigeration to other industries. Papers by Messrs. C. M. Simons, F. W. J. Moore, H. J. Ward, T. F. Mead and H. Birkett. Section V.—Application of refrigeration in Commerce and Transport. Papers by Messrs. J. T. Critchell, T. N. Wylie and J. T. Milton. Section VI.—Legislation, with papers by the Hon. T. A. Coghlan, Mr. Gilbert Anderson, Prof. J. Wemyss Anderson, Mr. R. M. Leonard, Mr. W. Lund, Mr. P. B. Proctor. Sir E. Montague Nelson is the Chairman of the British General Committee, and Sir Albert Rollit Chairman of the Executive. The details to be considered under each of the sections are:—Section I.—Effects of low temperatures and their action (physical, chemical and biological); general hygiene, advantages and disadvantages of refrigeration in dwelling places, factories, hospitals, etc., alimentary hygiene, dietetic value of chilled and frozen food. Section II.—Industrial methods for the production of cold. The construction of cold stores and arrangement of refrigerating appliances. Section III.—Preservation of meat and other perishable produce, organization of the meat industry, preservation of colonial produce, colonial produce capable of benefiting by refrigeration, food industries, artificial cold in the manufacture and preservation of butter, abattoirs, warehouses and central markets, army victualling, victualling of besieged towns and of troops in the field, sea fisheries. Section IV.—Horticulture, fermented drinks, ice making, mines, metallurgy, chemical industries. Section V.—The trade in perishable produce, land transport, sea transport. Section VI.—Official aids and legislative arrangements, instruction in refrigeration, insurance, the sale during the close season of cold stored game and fish, measures for providing for the masses. During the Congress visits will be paid to the Parisian Cold Stores and other places of industrial activity, while social events and the exercise of hospitality arranged for by the Reception Committee give promise of a most successful gathering. Excursions start on October 13th and terminate on the 22nd, during which the most interesting districts within the compass of the time may be visited from Paris. The municipality of Paris has voted over £1,100 for the entertainment of delegates on October 12th. The hon. secretaries of the British Committee are Messrs. R. M. Leonard and G. Lévy-Caen, 3, Oxford Court, Cannon Street, London, E.C.

The Marine Engineer

And Naval Architect.

LONDON, NOVEMBER 1, 1908.

ENGINEER OFFICERS.

THE serious conditions which may be set up in the Navy in the matter of lack of engineering efficiency, owing to a deficiency in the number of officers who are specialists in engineering, has been again brought into prominence by Mr. C .De Grave Sells in the 1908 edition of "Fighting Ships." It will be remembered that the engineering institutions of England and the leading technical journals have strongly urged that something should be done to remedy the evil without delay, and the former have proposed an independent corps of Royal Naval Engineers, who would be trained as engineers and who would devote their whole lives to engineering, these officers to have control in their own department, but in no case to succeed to the command of ships. We cannot help feeling that this was not only a reasonable proposition, but the only one that was likely to be successful. However, the authorities appear to think otherwise, judging by their decision to fuse the deck and engineer branches together and giving the officers in the engineering branch opportunities of succeeding to command equivalent to those in the gunnery and torpedo branches. While the scheme may appear quite sound and feasible on paper, it will on careful reflection be recognised to be likely to produce the opposite result, and lead to a decline in the specialist efficiency of both branches. As Mr. Sells points out, the "succeeding to command" has not been asked for, nor is it looked upon as in the slightest degree desirable by any engineer who has a real love of his profession. It would seem that the underlying principle of the scheme is that all the duties of the Navy shall be more or less common, with the result that in some cases important duties will be entrusted to men who are inefficiently trained for them, and in the case of engineering duties to those who obviously cannot be as well equipped as the present engineering staff. To illustrate the case in point, the President of the North-East Coast Institution of Engineers, in his opening address of the present session, stated that a recent order of the Admiralty had taken the mechanical charge of the gunnery and torpedo machinery of the fleet from the professionally-trained engineer branch and given it to the mechanically-untrained gunnery and torpedo branches. The result of such a policy is not altogether surprising, for in one of the latest battleships it was found impossible to work the guns or to hoist up the ammunition after the machinery had been in use a short time by untrained hands. To remedy the defective conditions set up the engineer staff had to be brought in and work night and day to get the gun gear in working order before the vessel could do her battle practice. We can usefully learn a lesson from our American cousins, who have been attacking the same problem. The Chief of the Bureau of Steam Engineering of the United States Navy, in dealing with the increasing dearth of experienced engineer officers, points out the necessity of officers in engineering specializing and the utility achieved by those officers who have done so. As he states, their primary duty on board ship is the care and manipulation of machinery, for which the eminently practical education in engineering is a most fitting prelude. It has been said that the fact that certain officers should be given further instruction in engineering requires no argument, as the character of their duties makes the necessity plain; and if this is so, why play with a question so largely affecting the efficiency of a man-of-war? To enlarge on the point, it is said that the duties of the specialist include, besides those on board ship, heads of department of steam engineering at various naval yards and stations, inspectors of machinery at private building yards, inspection of material at the numerous manufacturing establishments engaged in work for the Government, the designing of machinery at the Admiralty, and the inspection of detail designs submitted by contractors in order to make certain that the specifications have been fully complied with. It is clear that for these positions an officer must be thoroughly conversant with the profession of engineering, as upon his judgment depends the success of machinery installation of our ships, as well as the economical expenditure of large sums of money. It will be recognised that the designer must, in addition to being familiar with all the elements of machine design with current and best practice, have that intimate knowledge of the needs of arrangement and installation which can be obtained only by association with the finished product at sea. In this connection the most successful designers of marine machinery are usually those who have had sea experience and have had their existence made miserable by the faulty and academic design of an engineer who lacks the practical experience at sea. It has been on this account that the U.S.A. Bureau has always opposed the separation of the designing and of the operating engineer, and has reason to be satisfied as to the soundness of the policy from the results obtained. These matters are deserving of the most serious consideration in view of the importance of the efficiency of our navy being always held to be our first aim.

PRESIDENTIAL ADDRESS.

THE Presidential Address delivered to the Institute of Marine Engineers is full of interest from several points of view, and will stand reading carefully over, not once only, but several times, in respect to a few passages, which is equivalent to stating that the address may be placed on a plane with

the utterances of those whose words are profitable for teaching and exhortation. We would commend to our young men, the rising generation, the references made to the use of time to the best advantage and the avoidance of any tendency to waste it. The privileges now enjoyed by apprentices, as compared with those of past generations, are many and great in the direction of technical education and a knowledge of the elements which go towards building up mechanism for the utilization of power. The methodical application of spare moments towards the gaining of facts and the improvement of the mind contributes to the elevation of the industrious youth, adds to his enjoyment of life and makes him a better man. It is a remark pregnant of good thought that the strenuous life is to be preferred to the idle one, both as a life and as to the happiness it brings. The figures given by Mr. Denny as illustrative of the conditions ruling from time to time during the last half-century require to be analyzed and considered along with other facts which do not appear on the surface; they are of considerable interest, however, and serve to whet the appetite for more information as to changes made during the period cited in the different departments, both in the shipyard and the engine works. The introduction of labour-saving appliances and improved automatic machinery has no doubt had a considerable effect on the wage average. The enhanced cost of living is manifest and the causes are more readily traced, as the luxuries of one age tend to become the necessities of the succeeding one, and an increase of wages tends to enhance the cost of manufactured articles. The patriotic appeal made in the course of the address we cordially endorse, and, bearing in mind what has been handed down to us and what it has cost to build it, our duty doubtless lies in the way of maintaining and upholding our heritage unitedly for the common good and for the generations that follow.

CONGRESS OF REFRIGERATING INDUSTRIES.

THE International Congress of the Refrigerating Industries, which was held in Paris during October, was so successful as to warrant it being made an annual event. The papers were all interesting, many of them specially so, although the discussions on the various details proved of less than average value as contributions to the general information on the subject of refrigeration in its widest aspect. The commercial and social sides of such a Congress carry weight and value beyond the immediate intercourse and time spent in contact between the members, whose common interests have brought them together. The formation of acquaintanceships by those of different nationalities is calculated to assist in the adjustment of political differences, while, if these acquaintances ripen into a warmer sentiment, by so much the more will international politics be the gainer. Had the papers been less numerous, the general discussions in open meeting would probably have been better; as it was, there was a good deal of discussion outside at the close of each meeting, which was not without profit to many members, who sought to exchange opinions on subjects dealt with in the papers. Should a similar Congress be held next year, no doubt the details could be so arranged that a wider field for discussion would be possible. *Experientia docet.*

TIMBER.

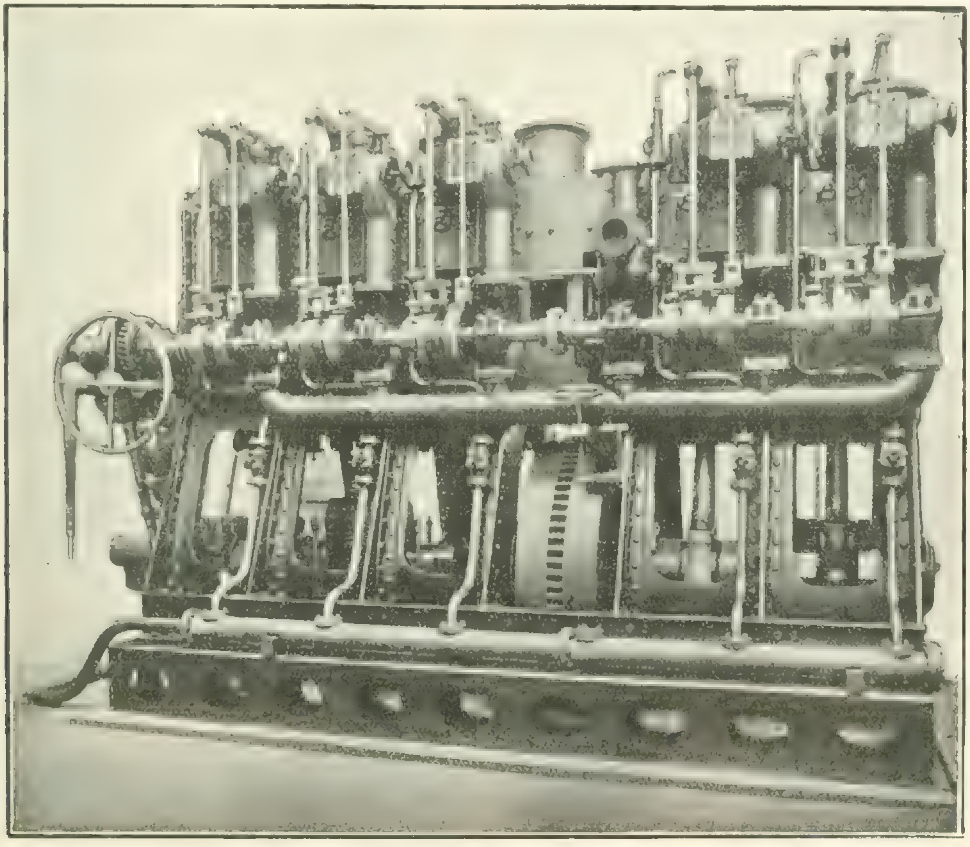
THE paper read by Mr. C. M. B. Dyer (member), before the Institute of Marine Engineers, on "Timber used in Marine Installations for the Carriage of Refrigerated Cargoes," came at a very opportune time, as the subject was dealt with at the Congrès in Paris and formed a fitting corrollary to the subject-matter which was in the minds of the members who attended the Congress. Several of the points dealt with in the paper read at the Institute were also dealt with in Paris, and we commend these to the attention of the Arboricultural Society and the Minister of Agriculture. The paper which was read at the Edinburgh Exhibition in August may bear fruit in the direction of tree-planting and the avoidance of almost wanton destruction of trees—a matter which was remarked upon in the papers read both at Paris and London. The cost of upkeep in connection with insulated spaces is considerable, and the discussions on the subject are with a view to minimize this by the elimination of elements which tend to destroy the woodwork, and, on the other hand, to discover a process which will preserve the wood by impregnation or otherwise. The surface coating of varnish which is used in some cases can hardly be considered a perfect preservative.

LLOYD'S REGISTER OF SHIPPING.—We have the annual report of this Society for 1907-8 before us and we find many points of interest in that report, which are well worth noting. We regret to have to record for the present year a notable decrease in the annual registrations, those for the present year being only 1,151,791 gross tonnage, making a reduction of nearly 25 per cent. on last year's statement, which, however, was the record statement for the last ten years. This includes the *Lusitania* and *Mauretania*, quadruple-turbine steamers of the Cunard Steamship Co., which have given such a fine record for their transatlantic voyages. Many turbine steamers have now been classed in Lloyd's Register, amounting to 165,922 tons, which is nearly twice as much as the similar figures for last year. The introduction of low-pressure steam turbines in conjunction with reciprocating engines is now engaging much attention, and it is hoped will prove a means for greater economy in the use of steam and for reduced consumption of fuel. It is well to record that the negotiations between the members of the British Government, including Mr. H. J. Cornish, the Society's Chief Ship Surveyor and one of the principal surveyors on his staff, with the German Government, has resulted in an agreement as regards the Free Board regulations, which will come into force slightly amended on and after January 1st, 1909. The scholarships of this Society, amounting to £50 each, must be remembered, as this year two new scholarships for marine engineering have been granted in connection with the Institute of Marine Engineers, making eight in all. In Cardiff, the comparatively new process of the oxy-acetylene process for repairing cracks in plates in steel have been examined by a committee and have been favourably reported on.

GAS PROPULSION OF H.M.S. "RATTLER."

H.M.S. gunboat *Rattler*, one of the "obsoletes" of the British Navy, has, as is now well known, been under private commission for a considerable time to the Marquis of Graham, of Brodick Castle, Arran, as Commander of the Clyde Division of the Royal Naval Volunteer Reserve, and with admirable loyalty and patriotism the vessel has been this year, and part of last year, used by this nobleman in a series of week-end cruises for the instruction and well-being of contingents of the Clyde Reserves, 80 per cent. of whom are working youths engaged in the shipyards and engine shops of the Clyde district. The main object of this article, however, is not to call attention to this aspect of the highly useful duties being performed by this "obsolete," but to record and describe another feature of usefulness which may, as in the case of an earlier namesake—which demonstrated to "My Lords" the utility of the screw propeller—be a factor in history making. We refer to the experiments connected with demonstrating the value and practicability of ship propulsion by means of gas engines, as yet comparatively novel in sea-going experience.

Messrs. William Beardmore & Co., Ltd., of Dalmuir and Parkhead, availing themselves of the *Rattler*, and enlisting the interest of the Marquis of Graham, dismantled and removed her propulsive machinery, and installed a gas engine and producer of the "Capitaine" type, in whose improvement and introduction to marine purposes they were interested. During the course of this summer, and part of last, the vessel and her machinery have been put to severe practical tests, particularly on a cruise about two months ago to and from Oban, when "rounding the Mull of Cantyre" was negotiated under most trying conditions as to sea and weather. The *Rattler*, now put to this excellent use, is an old gunboat 165 ft. in length by 29 ft. beam, and formerly was propelled by a set of triple-expansion engines supplied with steam from an ordinary marine return tubular boiler. The weight of this propulsive machinery was about 150 tons, whereas the gas engine, producer and accessories only weigh about 94 tons, and occupy much less space; the double advantage of weight and space-saving being, of course, a strong point in favour of the gas system, for mercantile vessels especially.



Gas Engines of H.M.S. *Rattler*. Messrs. William Beardmore & Co., Ltd., Engineers.

Recently, on the invitation of Lord Graham, a representative of "The Marine Engineer" boarded the *Rattler*, lying at the Tail-of-the-Bank, and having been courteously received by Lieutenant Sutherland, R.N.R., navigating officer, and Lieutenant Meyrick, R.N., Commander-Instructor of the Division, he was thereafter conducted through the machinery department by Mr. Andrew May, son of Mr. Wm. W. May, the manager of the engineering department at Dalmuir, who has been in charge of this undertaking from the outstart. Briefly described, and leaving out unessen-

tial details, which may in part be gathered from the illustration herewith, the machinery of the *Rattler* consists of a vertical five-cylinder, single-acting gas engine, with appropriate suction gas producer and accessories, of 500 b.h.p., the cylinders being 20-inch diameter by 24-inch stroke. As will be seen from the illustration, there is a heavy fly-wheel abaft the first two cylinders, having "barring" notches on the circumference. The revolutions of crank shaft at top speed are about 120 per minute. Owing to its special construction it is considered that this Capitaine-Beardmore engine may commend itself as one of the most suitable types of internal-combustion engines of large power for marine work. For convenience of modification, in an engine still experimental, and for lightness with requisite strength, the engine frame is built of steel plates and angles, the plating being curved round to form the crank-race and continued upwards to support the cylinders. These latter, with their heads, are the only important details made in cast iron. The open engine frame renders the connecting rods and cranks fully visible from either side. Each of the five cylinders is independent of the others, so that if desired one engine may be shut off and valves, etc., examined while the four remaining cylinders are working. The valves are all water-cooled, connections being made by flexible rubber tubes to a sort of cross-head on the stem. Low-tension make-and-break ignition is employed, each cylinder having its own magneto. This type of ignition has been adopted because of the moisture usually met with on board ship being apt to do serious harm where there are high-tension leads. Forced lubrication is used for the cylinders, but the main bearings—easily accessible in the open type of construction—are lubricated by hand.

Starting is effected by means of gas stored in reservoirs at a pressure of 95 lbs. per square inch. This is turned on, and the engine moved by a bar. The compression-relief cams being in action, there is no compression in the cylinder, and the momentary automatic depression of a special starting valve allows the gas to enter immediately before the firing point. A baffle device of numerous thin plates prevents any possibility of a back-fire in the gas-pipe. Moreover, the mixture cannot be fired until the admission valve is closed. As soon as the engine starts, the starting valve gear and the relief compression gear are, of course, put out of action. The engines are found to start away with satisfactory rapidity, and they are reversed by means of a hydraulic clutch and epicyclic gear on a principle well known to engineers. On this, and on the starting and governing of the engine, all highly essential points, it is hoped we may have something to say on a future occasion.

The gas generator of the *Rattler* is of the Capitaine type, such as the late inventor, Herr Emil Capitaine, introduced in association with his engine some four or five years ago into several vessels, with which he achieved some quite remarkable results in sheltered waters on the Continent. Messrs. J. I. Thornycroft and Co., along with Messrs. Beardmore, entered into an arrangement whereby the British rights in the system were taken over, and subsequently the first-named firm built, and equipped with plant constructed on the Capitaine system, a small sea-going yacht, *Emil Capitaine*, of 16 tons displacement and 10 knots speed, and probably the first vessel so fitted to venture on the open sea. The *Rattler* generator is adapted for using anthracite coal, and thus obviates the well-known difficulties of making and cleansing gas made from bituminous fuel. It consists of a cylindrical steel shell lined with fire-brick, and having a feed-hopper on the cover, the latter being water-cooled. The steam for vaporizing and generating purposes is obtained from vessels resembling small boilers, utilising the exhaust gases, and placed on the top of the engine cylinders. The cleansing plant is composed of a cooling tower, in which there is a water spray and a centrifugal cleanser, the usual coke scrubber and expansion box being thus dispensed with, and the system lends itself admirably to working conditions at sea. The generator and other features occupy only a small proportion of the space formerly required for the boilers. Feeding with 50 lbs. at a time is required only at long intervals, and attendance is thus minimized.

After leaving the producer the gas passes upwards through the cooling tower, which is simply a vertical pipe, in which it is cooled and freed from grit and dust by the water spray, and thence goes to the centrifugal drier in which a high-speed fan throws out all the water, etc., which is drained away to a water-seal. From the fan it passes to the cleaner, which is a square box fitted with perforated plates closely packed together, upon which settle all dirt and water that may possibly have escaped the action of the drier. The cleansed gas is drawn to the mixing valve on the engine, and thence to the several cylinders. Very little useful space is occupied by the washing, drying, and cleansing apparatus. Other auxiliary apparatus includes a small steam-driven compressor for filling the starting reservoirs. For this and other apparatus on board, for which steam is useful, a vertical donkey-boiler is installed.

The installation on the *Rattler* as a whole may or may not anticipate the final lines upon which large modern internal combustion plant may develop, but it marks, if not the first, certainly a highly important step in the realization of a problem upon which so many clever minds are at present engaged.

ASPINALL'S PATENT GOVERNOR Co., Liverpool, have been awarded a Diploma for a gold medal for their patent governors at the Franco-British Exhibition.

S.S. "GANEKOGORTA-MENDI."—Lately the steel screw steamer *Ganekogorta-Mendi*, built by la Compania Euskalduna de Construccion y Reparacion de Buques, Bilbao, for Messrs. Sota & Aznar, of Bilbao, proceeded to sea loaded with a full cargo of iron ore to make her trial trip. This vessel is of the single-deck type, three-deck rule, with poop, bridge and top-gallant forecastle, built to Lloyd's highest class and to owners' special survey. She is rigged as a two-mast schooner, having four large hatchways and is equipped with all the latest improvements for cargo steamers. Her principal dimensions are 320 ft. by 46 ft. by 23 ft. $6\frac{1}{2}$ in. depth moulded, carrying 4700 tons deadweight on 20 ft. draught. The propelling machinery has been constructed by Messrs. Blair & Co., of Stockton-on-Tees, this being a set of triple-expansion engines, having cylinders $22\frac{1}{2}$ in., by 37 in. by 61 in. by 42 in. stroke, and two marine horizontal steel boilers 14 ft. 9 in. diameter by 10 ft. long, working at a pressure of 160 lbs. per square inch. The trial of two hours' run turned out very satisfactory, obtaining a mean speed of $9\frac{1}{2}$ knots per hour. After the trial she proceeded to Rotterdam. She is the fifth boat built by the Compania Euskalduna for the same owners, and a sister ship to the s.s. *Udala-Mendi* built last January, for the same firm.

INSTITUTE OF MARINE ENGINEERS.

Presidential Address.*

ALLOW me to take the first opportunity that has offered to thank the Council and members of this Institute for the honour they have done the firms of which I am a member in electing me their president for the current year. The position is one of both responsibility and honour; the former no one can doubt who has realized the importance and success of the Institute, and the high position its members fill in the engineering world. If you take up the volume of its proceedings for 1907-8, you will find that its membership still increases, that it has a good credit balance on its yearly current account, while it has an invested capital—in one form or another—to the amount of about £3000. Its proceedings during that year were varied and interesting, its discussions were most instructive, and what must strike all who read them is their quite delightful want of any cramping formality; indeed, these discussions read much like what one would expect if they had been carried on by a large, united and interested family, although perhaps not so much in this as in other years. Papers read have dealt largely with breakdowns and renovations at sea, which branch of the business has been called "The Morbid Anatomy of Engineering," a branch of it that is certainly not the least interesting and valuable, and the special and frequent dealing with which renders the papers read to your Institute of special value. The whole volume compels its readers to recognise the energy and intelligence of the members of the Institute and of their officials, and makes it clear that the position of President of such an Institute is one of much honour. In further proof of this you have only to turn to the list of past presidents, and you can satisfy yourselves that it must have been so regarded by men whose names are known and reverenced by those connected with shipping all over the world. Some of the most highly esteemed of them have gone to their well-earned long rest, and it must be a matter of satisfaction to the members of this Institute that while they were with us the members showed their appreciation of their reputation and worth by conferring upon them the highest distinction it was in their power to bestow.

The honour and responsibility of your Chair, however, carry with them the difficulty of a presidential address. Ancient wisdom and modern research alike impress upon us the fact that "there is no new thing under the sun"; if a particular application of this saying is sought, it can be found nowhere more readily than in the case of presidential addresses; all institutes such as this have them, and annually as a rule. To find anything new or interesting to say under such circumstances is a difficulty, and how to overcome it must always be a matter of serious consideration to any one called upon to discharge such a duty; but perhaps some recollections and lessons and their application, drawn from an experience of fully forty-three years of marine engineering, may be of interest to you.

The changes that have occurred during this period, the advances that have been made in marine engineering, will undoubtedly compare with the changes and advances made by any other industry in the country. By the advances in marine engineering and the completion of the Suez Canal, which these advances made possible and profitable, the face of the globe has for all practical purposes, been altered; facilities for travel have been indefinitely extended, and the tendency of this must—however far off—be in the direction of annihilating national misunderstandings, and welding the human race into one homogeneous whole, when there shall be "Neither Jew nor Greek nor bond nor free." Thanks to the marine engineer, national isolation is no longer possible. While this is only a tendency meantime, leading unfortunately to cases of racial outbreaks and antipathies, in the end this tendency must be for the world's good; it has been, and perhaps now more than ever is, the dream of our loftiest thinkers and most earnest philanthropists; and to the possible future realization of this dream no industry has contributed more than our own.

Perhaps the progress during the period being dealt with may be best illustrated if we take two vessels both for the same owners, the British India Steam Navigation Co., which is well known to most of you; one of these, the *India*, built in the early sixties, and the other, the *Rewa*, built two years ago. The *India* was 230 ft. long by 30 ft. beam, about 1000 tons, and the *Rewa* 455 ft. long by 56 ft. beam, and about 7000 tons. The *India* was fitted with one simple two-cylinder engine, 46-in. cylinders by 3-ft. stroke, horse-power about 800; the water consumed per I.H.P. must have been approximately 30 lbs., but no accurate observations were then taken. The *Rewa* is fitted with three turbines with a shaft horse-power of about 10,000, and the water per shaft horse-power is 15 lb. for all purposes at the maximum speed. The *India* had two flat-sided boilers for 25-lb. pressure, with natural draught; the *Rewa* has two double-ended and four single-ended boilers of the cylindrical type, 155-lb. pressure, with forced draught, The speed of the *India* on trial was about 10 knots, and of the *Rewa* touching 19 knots. The *India* was the typical vessel of her fleet in her day; you will note that since then the tonnage—taking these two vessels as a comparison—has been increased seven-fold, the speed practically two-fold, and the power fully ten-fold. These are the broad bare facts and they show a sufficient advance, but in detail the differences are even greater. In the *India* the engine-room auxiliaries consisted of one steam donkey pump and one hand pump, while the number of pipes in the machinery space was in all seventy; in the *Rewa* there are thiry-five auxiliary pumps and engines of various kinds, and 960 lengths of piping. The *Rewa* is fitted with hydraulic gear, electric light, refrigerating machinery, all of which were unknown forty years ago. Such has been the advance in the machinery itself, but an even greater change has taken place in those who have charge of it. Then, ships were manned in the engine-room, to some extent by promoted firemen. Although unfurnished with Board of Trade certificates many of these men had a natural turn for engineering and did excellent work in their day, but it would have been impossible for them to fill the position and do the work of the present marine engineer. There is cause for much gratification in the way in which our marine engineers have responded to every call made on them, due to changes, multiplication of auxiliaries and improvements in engineering practice. Compare the *India* of more than forty odd years ago, with her simple engines and one donkey pump to be attended to, and consider the duties that have to be discharged now. Your marine engineer must understand and be able to overhaul hydraulic engines, electric engines and dynamos, refrigerating engines and main engines, which daily become larger and more complicated, the necessary minute acquaintance with each of which is almost an education in itself. Still further, the marine engineer has responded in most capable fashion to the latest and greatest improvement of all that has taken place by the introduction of the turbine for purposes of marine propulsion, which was surely a wide-enough departure from all his previous experience, and yet there has been no difficulty in obtaining engineers to run turbines successfully; but then they have been brought up trained to expect changes, to learn to understand them and to apply to them the practical experience they have already gained. Nothing surprises one coming into contact with the marine engineer more than how the raw lad, who, when just out of his time, has gone to sea, returns after a few years almost a man of the world—if that can be considered a term of compliment—capable of filling good and responsible positions and in no company at a social disadvantage, all of which has no doubt been due to the refining influence of brain work, without which no engineer can rise in his profession. It is hinted by some that we are becoming a decadent people, but even if there be ground for such a belief in some directions, it is certainly not the case with those whom this Institute represents; they at least are as capable and as able to hold their own with their fellows all over the world as were those who went before them. It is our pride and pleasure to know and be assured of this. It is true that to attain this they have had to lead strenuous lives, but the strenuous life makes good men, and the strenuous life is one good to lead. It is a misfortune that there is not more appreciation of the truth that good honest hard work contributes more than anything else to the happiness of our lives. The very general demand now is for more leisure and more time for enjoyment. Whether increased leisure will mean increased happiness is question-

* Delivered by the President, Jas. Denny, Esq., before the members of the Institute of Marine Engineers on October 5th, 1908.

Photo by Lafayette, Ltd., Glasgow

James Denny, Esq., President of the Institute of Marine Engineers.

able, idleness certainly will not bring it; and by increased leisure the output of organized industry may be diminished, and this again can hardly be beneficial in the long run. This digression seems somewhat out of place here as too much leisure or idleness is not what our marine engineers are likely to suffer from.

In the period under consideration, we have come then from the simple engine with jet condenser and 25-lb. pressure to the same engine with the surface condenser, then to compound engines with 60-lb. pressure, then to triple-expansion engines with 160-lb. pressure, then to quadruple-expansion engines with from 200 to 220-lb. pressure, and now to turbines, with a possible development of triple or quadruple engines in combination with turbines. The steam turbine, especially for marine purposes, is still in its infancy, although a very sturdy infant it has grown to. As you all know, it owes its inception and development for marine purposes to the genius, courage, and perseverance of one of your former presidents, Mr. Parsons. It has many advantages, and some disadvantages, as compared with the ordinary engine, but that the former much outweigh the latter is clearly evidenced by its large adoption in high-speed mercantile vessels, and its almost universal application to modern war vessels.

Practically all marine turbines, so far, have been of the Parsons type, but there are others, notably the Curtis, an American invention, for which excellent results are claimed. You have all, no doubt, seen the published results of the three duplicate American war vessels, in one of which ordinary engines were fitted, in another Parsons' turbines, and in the third Curtis' turbines; the vessel fitted with Parsons' turbines seems to have given the best results, although the predisposition in America must have been in favour of Mr. Curtis' invention, but it is understood the latter claims that he can considerably improve on the performance of the vessel which was fitted with his turbines. If he is correct in this view he may press the Parsons type. But, may we not be justified in assuming that Mr. Parsons is not at the end of his resources? But even should this not be so, Mr. Parsons will be entitled to and receive all the honour due to the pioneer who has fought the fight and borne the stress that pioneer work inevitably necessitates. All others must simply be followers in his footsteps and reapers of profit by the good work he has accomplished.

It has frequently been suggested that if some inspired engineer would evolve a system of gearing that would be lasting and reliable, not too noisy, and would not absorb in friction more than, say, 10 per cent. of power, turbine engines would be capable of application to any speed of vessel and to any size of propeller; you could then have a high-speed turbine and a low-speed propeller, which is the ideal condition for marine propulsion. This condition it is considered may be met in another way, which you will find fully described in a very interesting and capable paper read recently by one of your members, Mr. Durtnall. The system consists of a fast-running turbine driving a small dynamo, the latter again transmitting its electrical power to and driving a large slow-running motor on motors coupled directly to the propeller shaft or shafts. This arrangement does not eliminate the loss caused by the friction of the thrust of the propeller, as is the case in the turbine, and as also, by the way, would not be the case in any system of gear-driven propellers; otherwise one cannot but fear that the cost of this electrical system of propulsion will tell against it. A concrete case was recently put before a firm of electrical engineers who were strong advocates of such a system, but not Mr. Durtnall's; it was proposed to fit it in a ship, duplicate of one already at work with triple engines; the problem was the worst possible from the point of view of the advocates of the new system, but it was very carefully gone into and finally abandoned on account of the very considerable extra cost, and the doubt that existed if this would be met by the promised saving in coal consumption, even if the latter were attained.

There is still Mr. Parsons' latest system to test in the adaptation, or rather partial adaptation, of turbines to low-speed vessels: he claims that a considerable economy will be effected by using a higher vacuum than in the case of ordinary machinery, and by interposing between the main exhaust of the ordinary engine and the condenser a turbine driving an auxiliary propeller, that thus he will utilize the final expansion of the steam, which is largely lost in the ordinary engine, due to the smallness of the passages between the low-pressure cylinder and the condenser. There may also in this system be some gain due to the consequent less unequal temperature in the low-pressure cylinder, but that need not be gone into here. This system will be practically tried in a short time in a vessel for the New Zealand Shipping Company, and also in one now launched for one of the Atlantic lines; the results will be awaited with much interest by all interested in shipping. It is quite clearly understood that the crux of the problem is the relative efficiency of three propellers as compared with two, and this can only be determined by such practical experiments as are going to be made. Land installations have shown that the turbine, as arranged above, will give the economy claimed. Even if the first of the three-propeller arrangements does not give the results expected, a modification of the stern in the vicinity of the propellers, and of the propellers themselves, may finally bring them about. In any case, the experiment will be a most interesting one, and the owners who have sanctioned it are entitled to every credit for their enterprise.

Curiously enough, in a recent number of *Engineering*, that of September 4th, this very question of propellers of turbine-driven vessels was discussed at some length, and two very curious results were cited: one the case of the *Lusitania*, where efficiency was stated to be 48 per cent.; and the other the case of the *Salem*, the American Curtis turbine-driven steamer already referred to, where efficiency was stated to be over 60 per cent. These efficiencies, of course, you will understand have no bearing whatever upon the efficiency of the turbine, but only upon the efficiency of the propellers, and are obtained by taking actual resistance of the ship—ascertained by model experiment—and dividing it by the shaft horse-power. Very little reliable data has been published regarding the performances of turbine vessels, but from what is actually known one of the above results seems too low and the other too high; but even allowing for some errors in observation, it is still obvious that the propeller in itself is a much more important factor in the case of turbine vessels than in vessels fitted with ordinary engines.

Turning now to the conditions of employment during the last fifty years, and using all the best available data, it will be found that while the duties of marine engineers involve a much higher training, increased technical skill and knowledge, and undoubtedly also greater mental strain than ever before, the hard physical toil is now less. These two conditions seem to go hand-in-hand in all industries. Financially during the above period their position seems to be 30 per cent. better in regard to actual pay; this is based on the returns of one of the largest ship-owning firms in our country; but then the standard of living is such now that the comparison is hardly a fair one. In the case of the workers in the actual production of marine engines, the same experience is found. Hard labour has been almost entirely abolished by the extended use of machinery, and, more recently, by the introduction of power drills and chipping hammers driven by compressed air or by electricity. As to the financial position of these workers, and taking the figures of the engineering firm of which I am a member, and using them "full and bye"—as one says at sea—that is, the gross wages paid per annum to all paid by the week, man, woman and boy, which eliminates all men on salaries, and dividing them by the average number of workers, also assuming that year in, year out, overtime earned and night shift and the like allowances will average about the same, it is found in the year 1852 the weekly wage per head was 14s. 10d.; in 1861 it was 17s. 6d.; in 1871, 19s. 7d.; in 1881, 20s. 4d.; in 1891, 27s. 4d.; in 1901, 34s. 5d.; and in 1907, 35s. 7d.; being an increase of nearly 140 per cent. in forty-five years, and to some extent attributable to the introduction of piece work. The standard of living, however, again vitiates the comparison. Speaking for Scotland, the frying-pan seems to be displacing the porridge-pot, and the cigarette the pipe. With us there forty years ago, the bliss of a Sunday morning found expression in the phrase, "A long lie and a tea breakfast." While the long lie is happily still in the future, the tea breakfast has ceased to be a Sunday morning luxury. This increase of pay ha been brought about by the ordinary recognised trade customs among which, it is to be regretted, strikes and lock-outs are still to be found. It has not come about by any of the revolutionary methods that we now hear so much of, and which seem always to crop up when trade is bad; methods by which the capitalist and organizer are to be abolished

and the actual workman to be the supreme head. That such a fantastic and dangerous course should be advocated by those who claim to represent organized labour, while it is to be deplored, is hardly a matter for surprise when the robbing of hen roosts, even if facetiously, is hinted at as a means of raising the national revenue!

Our view of our dependencies abroad and the responsibilities thereby falling on us, which is generally known as the imperial idea, has especially of recent years been much before us. While not forgetting that we have a foreign trade as well as a colonial trade, this idea should appeal especially to us as marine engineers, for as marine engineers we visit every part of the empire, our means of living are largely due to it. If it lose its hold, if every country now bound up with ours in the congenial bonds of common race and interests is to lock its door, so to speak, and be a sufficiency in itself, to itself, what will become of our occupation as marine engineers either on land as manufacturers, or as users at sea? Our empire is none of our making; our forefathers did that for us at almost incredible sacrifices, which we can hardly understand and certainly do not realize. At times it seems as if the burden of empire had become too heavy for us, and that we were prepared to let it go rather than face the efforts and sacrifices necessary to maintain it. We have been almost too prosperous, and perhaps our lives have been too easy; but we can always hope that under the surface the old spirit that made the empire still remains and only needs fitting cause to bring it to sight and use again. We must hope that it is so for the sake of those who are to come after us, and out of the commonest of gratitude to those who were before us, and to whom we owe not only our material prosperity, but, far and away beyond that, the greatest blessing that any nation can possess, our spiritual and political freedom.

As marine engineers you have one great advantage over those who build the ships and engines, whose welfare is in your hands; you can see the actual results of your labour and their working out as improvements or the reverse, and you can modify your practice accordingly. If you find your engine not acting properly, you ascribe this to one, two, or perhaps three possible causes; you naturally deal with No. 1 as being the most likely, and finding no improvement you fall back on No. 2 as the supposed cause, but it may be that No. 3 or even No. 4 adjustment has to be made before you discover the real source of trouble. Most of us have heard marine engineers graphically and interestingly describe such experiences. Sometimes these confidences have been evoked by a desire to see if their hearers can solve the problem of some obscure mechanical disease which has puzzled them, and interesting exchanges of views result. Such experiences, though annoying at the time, are of more value than years of everyday work when all goes well; but the point to be made clear is that you have to your hand the power of experimenting, testing, and seeing the result of your ideas and theories, whether they be good or bad. Very different is the position of the shipbuilder and engineer; he builds his ship to his own satisfaction if it may be so, but certainly it must be to that of the owners and their technical staff; he tries the vessel either on the mile or for a prolonged spin, either at or not at a suitable draught, as may suit the convenience of the owners. If the trial is successful the vessel passes out of his hands and into theirs and yours; he may have accomplished his speed and fulfilled the conditions of his contract, but the doubt whether he has done the best possible under the conditions open to him must always remain. Some modification of the lines of the vessel or in the propellers might have considerably improved the performance. But neither time nor money is available for such experiments, whereas the marine engineer at sea can constantly experiment, and often does so as part of his daily routine, with a view to getting the best possible performances out of his vessel and her machinery. Now, combination of interests in various trades had some considerable vogue a few years ago, but such combinations were not always successful. In shipbuilding, so diverse a trade is it and so diverse are the interests of those engaged in it, such a combination seems impossible; but consider how much would be meant by a combination of all the technical knowledge and experience of all the shipbuilders and marine engineers of this country. It might even possibly bring with it the advent of what has been so long earnestly, and is still vainly, sought after, and what seems impossible of attainment—the perfect ship. Such a combination of information is unattainable; every shipbuilder and engineer has special technical knowledge and experience, and these are his stock-in-trade, by which he hopes to do better than his neighbours for his friends the shipowners, and so secure remunerative business. That we all try to do better than our neighbours is admitted; there would be no advance otherwise. At times this ambition overleaps itself, and mistakes are made; but these again are not without their great value; they are a wholesome lesson, and it is unlikely the same error will be made twice. Almost the wisest and shrewdest man in our business was my late partner, Walter Brock, who made a name for himself as a marine engineer, second to none of his day. He never failed, when the opportunity presented itself in the way of encouraging others, to point out the lesson that he had learned and profited far more by the mistakes he had made than he had by any of his successes, and he was right! for it was not difficult to get "off the rails" in marine engineering, as perhaps one or two instances which follow may show without unduly wearying you.

The first is the trial-trip history of two paddle steamers; the first was an entirely successful vessel of 18 knots. Another was required much of the same type, but finer and longer, consequently more easy to drive at the same speed. Nineteen knots was to be her speed, and it was found that her resistance at this speed was practically such that on the usual formula based on speed and power and float area and immersion, the same size of wheel would be suitable which had given excellent results in the previous 18-knot vessel. When the 19-knot vessel went on trial the results were distinctly disappointing, the speed was barely 18 knots, and yet the power developed and the revolutions were just what had been expected for 19 knots. The slip naturally was abnormally high. There was no question of the wheel working in the hollow of a wave, as that had been carefully tested. One evil was quite patent, the abnormally high slip. To remedy this the floats were fitted with temporary eke pieces 6 in. deep, on the outside of each float, thus increasing the diameter of the wheel by 1 ft. An interesting and somewhat dramatic trial followed, which resulted in a mean speed of 19·4 knots being obtained, an increase of nearly $1\frac{1}{2}$ knots, all due to this apparently slight alteration; but who can say that a still better result might not have been obtained by further modifications? However, the vessel had to go on service, and no more trials were possible. The explanation of this improved speed was somewhat difficult, but it was finally assumed that the higher speed of the floats through the water, due to the higher speed of the vessel, had set up excessive cavitation, and that this cavitation was checked by the increased float area due to the temporary eke pieces above referred to.

The second example of how easily one can "go off the rails," is afforded by the case of a turbine steamer where the speed expected was barely obtained, whereas a good margin had "on paper" been looked for. The design in all respects was apparently quite conventional, both hull, stern fitments and propellers. Again abnormal slip appeared. The correction of this in a turbine steamer was not quite simple. To increase the diameter in the ordinary way meant diminished turbine efficiency. The remedy was sought by increasing the propeller diameter and fining the pitch. By this means the turbine revolutions were not much reduced, and so turbine efficiency was maintained. The slip was brought down to normal, and the contract speed of the vessel was obtained without any difficulty. Such occurrences, while harassing at the time, are undoubtedly of great value, and force those who experience them to go still more deeply into the scientific and experimental sides of their business, and this, while of much benefit to them, is finally to the profit of the shipowner.

As has already been said, the turbine is still in its infancy, and this question of the propellers for turbine engines is one which perplexes all who have studied the matter. The best practical remedy seems to be to peg away at trials, obtain all possible data, and tabulate and analyse such data carefully for future use; by this means in time there will be obtained the power of arriving at the best possible results under any given conditions with at least some fair degree of accuracy. You all know that as the turbine increases in the revolutions which are practicable in marine work, its efficiency increases; to obtain high revolutions the propeller sizes must be cut down, but this again decreases their efficiency, and the diffi-

culty has always been and still is to strike the crossing lines of propeller and turbine efficiencies, so as to obtain the best combined result in terms of water used or in what is equivalent—coal consumed into the speed of the vessel. Coal consumed per shaft horse-power is not a measure of efficiency in the case of turbine-driven vessels; the only basis is as already stated—coal consumed in relation to the speed of the vessel, as is indeed the case with ordinary engines. You know in a general way that turbines as at present constructed are not suitable for low-speed vessels, but the reason why this should be so may not be quite so clear to you. You will best understand the reason perhaps by an illustration, always bearing in mind that the peripheral clearance of the blades and dummies is the important factor in the economical working of turbines. Take two vessels, one with a speed of 22 knots and the other with a speed of 12 knots, each requiring 10,000 horse-power for this speed. Design the propellers in each case on the usual basis for turbine-driven vessels, and make the turbines to correspond. In the case of the 22-knot vessel you will have propellers about 5 ft. diameter running at nearly 700 revolutions, and in the 12-knot vessel the corresponding figures will be 13 ft. diameter and 110 revolutions. Turbines corresponding to these revolutions will have such clearances that in the case of the slow-running vessel the clearance will be about five times as great as in the quick-running vessel. This clearance and its consequent leakage is the cause of want of economy in turbines of vessels running at slow speeds. A high blade in proportion to the diameter of the rotor, which is not admissible in such vessels, seems to be essential to economical working of turbines. While dealing with clearances, your attention may be called to an ingenious and simple invention recently brought out by Mr. Parsons, which he calls "tipping the blades." By this system, which will reduce the blades to a minimum section at the very point, it is safe to run turbines with much diminished clearance, and so increase their economy.

Reverting to the question of reliable data, marine engineers can be very helpful in such matters if they keep careful and systematic records of their ships' performances under varying conditions of weather and draught. As a matter of fact, all manufacturing marine engineers do get valuable information from this source, but it is not given so fully and systematically as might be. It is suggested that superintendent engineers, who have varied types of steamers under their control might draw out a form of log, which, being duly filled in, would be of much value to shipbuilders for future requirements.

The past has seen great changes in our business—what does the future hold for us? Apparently at least there is to be no standing still. The combination engine and the turbine-driving propellers by electrical transmission have been already referred to, but there are other systems that have been suggested and advocated with at least some degree of reason; these are internal combustion engines, gas engines using producer gas, and oil engines: the first and last are used successfully in vessels such as racing launches and other craft of small size, but matters are hardly ripe for their introduction on a large scale; the gas engine has also been given a trial, but the results seem so far to be inconclusive. The extended use of the water-tube boiler in vessels where weight is a serious consideration is one of the problems that must be solved sooner or later. Small and tentative experiments in this direction are even now being made by two enterprising bodies of shipowners, the South-Eastern and Chatham Railway Company and the Irrawaddy Flotilla Company; if these experiments are successful, considerable modifications will take place in Channel and light-draught vessel practice. The consideration and possible solution of such problems as have been mentioned go to show that in the technical side our business is alive and active. It is a matter of regret to all concerned in it that from other points of view the state of affairs is not so satisfactory. Shipowners complain bitterly, and no doubt justly, of the lowness of freights, and the unprofitable nature of their business. Shipbuilders and engineers have got a stage beyond complaining, and are becoming almost callous to the stagnation that exists. Orders of any kind are of the scarcest, and such as are placed are given out at prices that must be unremunerative. For all this there seems to be no remedy but a general improvement in trade—how or when that is to come no man can tell. The present state of affairs is rendered even more intolerable by the deplorable amount of unemployment which has resulted, which all recognise and regret, and which all more fortunately placed are endeavouring to alleviate. So far it has been borne with a fair amount of patience. We have had periods of dull trade before, but none so severe as this. Is there a remedy? If there is, our wisest politicians have not been able to discover it, or it would have been adopted long ago by the goodwill of both parties in the State. The so-called remedy of handing over all industrial production to the Government of the country is contrary to common sense and human nature, and if it were applied would entail disastrous hardships on the generation that strove to put such a remedy into practice. There seems little we can do, but give all possible help to tide over this evil time, and hope for that revival in trade which must, by natural means, come sooner or later. Like all troubles it has its good side; it must have awakened our people to the need of greater providence when times are good, each one learning by his own experiences that the rainy day is bound to come again sooner or later. It must have brought to our shipowner many valuable lessons—to the shipbuilder it certainly has; the last few years of fiery competition have impelled him to desperate efforts at increased economy of production; as a result foreign competition in shipbuilding is not meantime to be feared. In no other country in the world is our industry carried on so economically and efficiently, and we are thus assured of at least a present retention of our trade, such as it is. Thus our present dark cloud has its silver lining, and all who suffer from and come through this period of darkness will in the end find some compensation and profit in the discipline these trying times have compelled us to undergo.

FRANCO-BRITISH EXHIBITION.—The firm of Messrs. Wailes, Dove & Co., Ltd., who exhibited at the Palace of Machinery their patent "Bitumastic" enamels as applied to the ships of the British and Foreign Admiralties, the mercantile marine throughout the world, and to the plant of the chief industrial concerns, railways, and municipal corporations, in the United Kingdom, have been awarded two diplomas of the highest merit with gold medals in classes referring to the mercantile marine and civil engineering respectively. This firm also received gold medals at Genoa 1905, Milan 1906, Savona 1906, and Bordeaux 1907, for superiority of the anti-corrosive qualities of their patent "Bitumastic" enamels, covering, and solution.

OXY-ACETYLENE PROCESS OF REPAIRS.—The work referred to in our last issue as executed on a set of marine boilers by means of the oxy-acetylene process, and the expert details of which were dealt with by the British Oxygen Co., has led to other work of a similar nature on a steamer in the Royal Albert Dock, London, being entrusted also to the same Company. In this case the fire boxes of the main boilers had been giving trouble for some time, due to leakage at the landing of the furnace and the back tube plate, with the result that frequent leakage and caulking had left but a small margin of plate beyond the rivets, added to which defect several cracks had developed. The difficulties, with the risk of a continuance of trouble in dealing with such a case by patching, are obvious to engineers, and the opportunity was met by the comparatively new process. The rivets were removed all round the crown flange of the furnace where attached to the tube plate; the cracks on the latter were then filled up by the process, served by an expert hand of the Company. The wasted part of the tube plate was also made up by the addition of fully half-an-inch to the landing edge, the whole was then re-riveted and caulked, after which the boiler was tested to 320-lbs. water pressure and the work found satisfactory. Another piece of work we have seen done by the process was the building up of a boiler end shell plate which had become wasted away almost into the rivets at the bottom man-hole door; a patch would have involved a considerable amount of work and expense with the cutting away of the shell plate, and it was decided to have the rivet holes filled up by the oxy-acetylene process and the plate built up to the required breadth of landing, after which fresh holes were bored and the work completed satisfactorily. The boiler-maker part of the work in this steamer to follow up the process and complete the whole, including the water test, was carried out by Messrs. Silley, Weir & Co.

THE "SCHROEDER" RATCHET SPANNER.

WE illustrate in the adjoining diagram an extremely useful form of box spanner, fitted with interchangeable discs, which is put on the market by Messrs. Nettlefold and Sons, Ltd., of 54, High Holborn, London, W.C.

The frame of the spanners is of drop-forged high quality steel, having circular-machined eyes at each end, into which the interchangeable discs, to fit various sizes of nuts, are inserted. These discs are of mild steel, and have machine-cut teeth around their periphery; they are kept in place in the frame by means of a half-moon guide mounted on a pawl, illustrated, separated in fig. 2, a groove being formed in the disc with which the guide engages. The toothed pawl is mounted to slide in the frame, and is spring-pressed, provision being made to prevent it being wholly ejected from its socket. The teeth of the pawl engage against the teeth of the disc, and have a ratchet action.

In the recess in which the pawl slides is a step or projection, so arranged that immediately the pressure is put on the pawl it is forced over on to the step, and thus the device becomes practically a solid spanner, no strain whatever coming upon the spring, which

only acts to keep the pawl engaged in the teeth when no pressure is being used.

In order to change the disc the pawl is drawn back to the bottom of the recess against the spring pressure, when the disc can be pressed out.

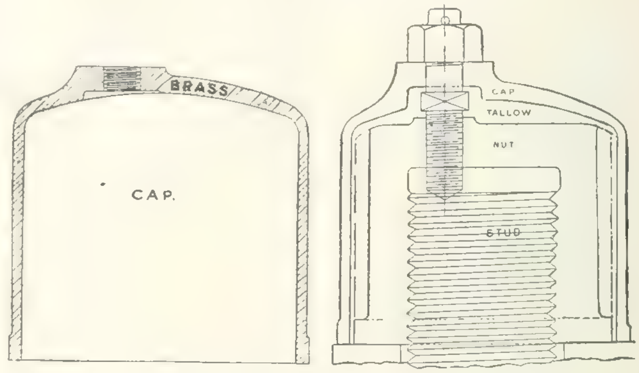
INSTITUTE OF MARINE ENGINEERS.—A paper on "Some recent developments in surface condensing apparatus" will be given before this Institute by Mr. Robert Bruce on Nov. [illegible]

THE MANCHESTER ASSOCIATION OF ENGINEERS.—At the meetings of this association to be held during the month, papers will be given by Mr. W. A. Tookey on "Oil Engines" (Nov. 14th), and Mr. S. N. Brayshaw on "Hardening of Carbon Tool Steel" (Nov. 28th.).

FRANCO-BRITISH EXHIBITION AWARDS.—We understand that a gold medal has been awarded to Messrs. Bergtheil and Young, Ltd., of 12, Camomile Street, London, E.C., for their new patent electric punkah, which they exhibited at the Franco-British Exhibition. It is interesting to note that this is the only gold medal which has ever been awarded for a mechanical punkah, and the fact that the punkah secured the diploma speaks well for the ingenuity and utility of the invention. We also learn that Messrs. Bergtheil & Young, Ltd., are in negotiation with a number of the largest and best-known shipping companies with the view to the installation of their punkahs in the saloons and cabins of the large ocean-going vessels.

PATERSON'S PATENT PROTECTING CAP.

THE marine engineer is fully conversant with the rapid corrosion which takes place on the nuts and studs holding on propeller blades, particularly where bronze is the material used, and in order to meet this difficulty Mr. W. L. C. Paterson, of the



Paterson's Patent Protecting Cap.

Anchor Line of steamers, has designed a cap or hood which he claims is a complete preventative against corrosion, and at the same time provides the usual hold-fast set pins to keep the nuts from loosening back and dispensing with the use of cement as a protection, which is so often found on dry-docking to be cracked and broken off.

The adjoining diagram shows the device very clearly. The nut carries a screwed set pin through its upper part, which bears on the stud and prevents the nut slackening back. This pin is extended upward as a stud and passes through the protecting cap, an external nut bearing down on the cap to keep it tightly in place. In the space between the cap and nut tallow should be introduced to prevent any water getting to the nut or interior of the cap.

The device is being put on the market by Messrs. D. & W. Henderson & Co., Ltd., 190, Elliot Street, Glasgow.

CRUISING YACHT.—A new auxiliary cruising yacht for an English owner has been designed by Mr. James A. Smith, M.I.N.A. She is intended for cruising and fishing round the coasts, and is 23 tons Y.M. The yacht is fully rigged as a ketch, and has an auxiliary motor of sufficient power to drive her at 5 knots in a calm.

NEW TUG FOR THE KARACHI PORT TRUST.—The steel twin-screw tug *The Collector* has left the Tyne on her voyage to Karachi to her owners, the Port Trust of that place. Her dimensions are 95 ft. 6 in. by 20 ft. by 9 ft., with 450 I.H.P. and a speed of $10\frac{1}{2}$ knots. She was contracted for and designed by Messrs. James Pollock, Sons & Co., Ltd., of London, a number of works contributing to her construction. Her trials took place in bad weather, but she proved herself an excellent sea boat and generally appears to be a good sound specimen of what might be called the "working class" of floating property, but with teak decks, boats, saloon and accommodation for officers, steam windlass, special engine room ventilation, etc.

THE FLEETS OF THE MAIL LINES.

(*From our Own Correspondent.*)

Shipping Finance.

THE incident of the month has been the issue of four and a half per cent. debentures by the Oceanic Steam Navigation Company, Limited, of Liverpool. This is, of course, the concern which is known all over the world as the White Star Line, and the idea of its going to market for money in this way is no doubt extraordinary—on the first blush at least—to those who remember its history and the story of its unparalleled prosperity and conservative finance under the direction of its founder. Yet when we come to take the smallest consideration on the subject we cannot fail to realize that conditions have changed so greatly in the shipping world, especially in that section of it which deals with the passenger trade of the North Atlantic, that for the White Star Line to feel that it must do as others do and pay for its new tonnage by a mortgage on its existing fleet, is by no means a remarkable thing in itself.

The prospectus reminds us of many things which are not actually disclosed by it in type. For example, we are told that the company was founded in the year 1869. And our thoughts flash back to the original *Oceanic*, crack ship of her day but costing —and that is the point on which I am at the moment—but a trifle of a hundred and twenty thousand pounds. The capital of the company at its inception was, I believe, some seven hundred thousand pounds, enough to provide a sufficient fleet of original *Oceanics* to maintain a weekly mail and passenger service between Liverpool and New York. That initial capital was not increased for many years. New steamers were added to the fleet and paid for out of earnings. Even the production of such vessels as the *Britannic* and the *Germanic*, which cost a couple of hundred thousand pounds, did not necessitate the raising of money on debentures. Then there were many years when no Atlantic mail steamers were added, the reserves being strengthened, and vessels of the old *Doric* type were put forward, vessels which built up the company's reputation in the New Zealand trade and in the trans-Pacific passenger service. Then came the initiation of the fleet of Western Ocean tramps, as Mr. Ismay called them, cargo steamers of the highest class they were in point of fact, and they became the examples of the up-to-date freight carrier of modern times. The earnings of all these ships, after paying a good dividend to the fortunate shareholders, was sufficient to build up a fund equal to adding to the fleet at the end of the eighties the two finest mail steamships of the day, even though their united cost cannot have fallen below a total of, say, eight hundred thousand pounds, a sum exceeding by one-eighth the total nominal capital of the company.

It were tedious, perhaps, to go on. But the fact remains that when the combine acquired the share capital of the concern there was in its possession, and paid for, a single ship whose cost was equal to the whole of the original capital. Now the fleet stands in an extraordinary position. It comprises some 311,000 tons of twin-screw modern shipping. Of that large total no less than 250,000 tons have been built (or purchased from those who built it) within the named period of ten years. The provision of such ships as have been added of recent years—the *Adriatic*, *Baltic*, *Cedric* of one service, the *Republic* and *Romanic* of another—as well as of the huge ships which now maintain the services to Australia and New Zealand, cannot but have depleted the reserves which have been provided for the replacement and extension of the fleet. The wonder, indeed, is that those reserves have been equal to the strain which this persistent building of vessels, each greater than the last, has put upon it. Now orders have been given to Messrs. Harland & Wolff, who, of course, are responsible for all the existing ships in the fleet, for four great steamers. Two of them, the *Laurentic* and *Megantic*, are in a forward state of construction, one of the sisters being actually in the water and preparations for the construction of the two larger vessels, to be the largest ever built, are now in a forward state. This order involves the building of, say, 28,000 tons in the two St. Lawrence-trade vessels, and of from 80,000 to 100,000 tons in the New York passenger-trade ships, and the money to be provided will come to no less than £3,600,000. So it is hardly wonderful that the managers of the company want a loan. They do not ask for much in comparison with the cost of the security they have to offer or of that of the property for which the proceeds of the issue are to pay in part. The amount now asked for is but a million and a quarter, being the first half of an authorized issue of £2,500,000. The issue price is 97½ per cent. and the success of the deal is guaranteed by an underwriting contract on which a two per cent. commission is payable. The security specially hypothecated to secure the debenture holders comprises twenty-three steamers of the White Star fleet, whose aggregate tonnage, as I have said, is 311,000 tons, and whose value, according to the opinion of Messrs. Kellock's, is no less than £4,850,000 sterling.

There is, however, one point not mentioned in the prospectus which one is inclined to think might well have had reference, though indeed it is common knowledge. The point is, of course, the fact that the share capital of the Oceanic Steam Navigation Company is now held practically in its entirety by a foreign corporation, the International Mercantile Marine Navigation Company, to wit. It may be rejoined that the identity of the shareholders does not affect debenture holders' security, and where there is a free market in the shares that statement would be absolutely the fact. But in the present case, save in the event of a break-up of Mr. Morgan's combine, the shares of the Oceanic Company are never likely to be brought to market. The whole object of those who hold them is to retain them and the control of the fortunes of the White Star line which their possession gives, in order that the splendid services which it maintains may work for the benefit of the whole organization which they have collected.

Prosperous and vast as the White Star Line undoubtedly is, it is after all but a limb of a far larger organization which cannot be so prosperous as this company, for we see from the published accounts of the combine that it is not able to pay dividends on its share capital.

The earnings of the White Star ships must, therefore, be going to fill up the void in the profit and loss account of other associated companies, and for that reason unless conditions mend through the whole line of these corporations, there must eventually come trouble. It can hardly really affect the debenture holders, for their security is, as we have already seen, amply covered, whilst they must in any case be paid off, as to both interest and capital, at par before the expiration of fourteen years from the present date. But I think, for the reasons I have adduced, that the fact that the fleet is part of a larger whole should certainly have been mentioned in the prospectus.

In regard to another matter it may be mentioned that the report that the now omniverous West India Royal Mail Steam Packet Company is about to devour the Bucknall line of steamers is alleged to be without any foundation.

The Proposals of Herr Ballin

for the purpose of lessening the strain of competition in the North Atlantic trade are well intentioned and obviously founded on a vast experience and deep study of the conditions prevailing in the business. The only possible objection to them must be that they are impracticable. He would have obolescent ships broken up so as to take them out of the struggle and to prevent them undercutting the better class of vessel. If he could control the output of tonnage and restrict the entrance of new competitors into the arena all might be well, even though it may be extremely probable that the lines in the ring itself would never quite agree in their views as to what ships should be broken up at once and which should be spared for a little longer service. But as long as tonnage can be built and new companies enter the struggle so long will the benefit of any sacrifices made by those inside be apt to be pounced upon by strangers and thus render them worse than useless to those in whose interests they were projected and carried out. The suggestion of an arrangement whereby a daily service might be instituted is an old one—I fancy it must have been made first almost a generation ago. But till a high-water mark of speed be discovered, and till the crack ships of all the competitors attain it, there will always be a difficulty in the way of the carrying out of the scheme. A sailing plan which

gave the *Arabic* on Monday, followed by an *Umbria* on Tuesday, a *Kaiser Wilhelm II* on Wednesday and a *Lusitania* on Thursday would, of course, give daily sailings on the days named. But it would by no means ensure daily arrivals, and people generally put to sea with some regard as to the time of arrival at the harbour where they would be.

Sea Cooks.

The first prosecution under a statutory provision which should accomplish a good deal for the comfort of the crews of our larger vessels, has just taken place at the Mansion House Police Court. The provision to which I refer is one of the numerous enactments of the Merchant Shipping Act passed in the year 1906, though in order to give ample time to shipowners and shipmasters to put their houses in order, it did not actually come into operation till the 30th June of the present year. The gist of the point is this. Foreign-going steamships of over a thousand tons gross register must now, unless there be some reasonable excuse for the omission, carry duly-qualified cooks. And a duly-qualified cook for this purpose is one who either had seen two years' service as a sea-cook previous to the date at which the law on the point became operative, or he must have such a certificate of competency as will satisfy the requirements of the Board of Trade. Various institutions now issue certificates which qualify candidates for the post of ship's cook. Further, the person who is to act as cook must be rated in the articles as ship's cook, and in emigrant ships the ship's cook must be additional to the cook to be carried under the requirements of the older acts for the service of the emigrant passengers. The case to which I refer was brought against the master of the steamship *Pinta*, of some 1,400 tons, for proceeding to sea from the port of Swansea without having fulfilled the requirements of the law by providing a duly-qualified man for the post of cook. The prosecution showed that the provisions of the law were actually brought to his notice, that he was told of available and qualified men who could be obtained at short notice and that he did not attempt to do anything towards the fufilment of this legal obligation. In the event he was fined in the maximum penalty—twenty-five pounds.

The P. & O. Company.

Another of the three great mail steamers which this Company are adding to their "M" class has now been launched. This vessel is the *Malwa*, which took the water from the yard of Messrs. Caird & Co., at Greenock, on the morning of the 17th October. Her sister, the *Mantua*, will follow in a few weeks, being under construction by the same builders.

The first of the trio had been entrusted to another Clyde firm, Messrs. Barclay, Curle & Co. The characteristics of the "M" class are so well and favourably known that it is perhaps hardly necessary for me to go into details here. Suffice it to say that the new ship has a tonnage of about 2,000 tons greater than the earlier sisters, being of about 11,500 tons gross register. Her length is 560 feet with 61 feet beam.

Casualties.

There have been one or two rather important losses during the month. Amongst them may be cited that of the Lamport and Holt liner, *Velasquez*, which stranded at Ponta Cella, near Sao Sebastian, on the night of the 16th October. She lay hard on the rocks, her engine-room was holed, and she soon began to break up. The ship herself was a valuable one enough, being worth some £115,000, of which £25,000 was covered by her owners. Her cargo also was important, comprising a considerable amount of coffee, though, at the moment it is not quite certain how many thousand bags were actually on board. The owners are much to be sympathised with under the circumstances, as the ship was one of the newest and finest of their fleet, being only two years of age and of 7,542 tons gross register. With her two sisters *Verdi* and *Voltaire*, she was engaged in the trade between Monte Video and New York.

The loss of the public yacht *Argonaut* by collision off Dungeness caused a good deal of interest in the public press, as there were a large number of passengers on board, the ship being bound for the Mediterranean on a pleasure cruise. The accident occurred during a dense fog on the 29th September, the colliding vessel being the steamship *Kingswell*. There was no loss of life.

The old *Argonaut* commenced her career on the Thames as long ago as the year 1879, being built by the firm of Messrs. R. & H. Green. Originally she was called the *Norfolk*. But she soon found her way into the fleet of the West India Royal Mail Steam Packet Company and under the name of *La Plata*—a very favourite name in that fleet—she did many years' work in the passenger service. Being cast as a mail steamer, she went into the public yachting business, and soon acquired the name of *Orienta*. Subsequent changes of ownership saw her re-named *Norse King* and finally *Argonaut*. She lay with her masts showing, but there seems no chance of any salvage and the Trinity House authorities have commenced to remove such portions of her as are dangerous to navigation.

Sir Christopher Furness and his Employees.

The sympathy and interest which Sir Christopher Furness has always displayed in those who work in his employ has always been well known and one can quite understand the amount of care and thought which he has devoted to the pleasant task of considering how he may avoid labour difficulties in his numerous works, and at the same time benefit the people with whom he has so long been concerned. Troubles between capital and labour have unfortunately been rather in evidence of late in the North-east Coast shipbuilding yards, and Sir Christopher has been anxious to put an end to them. He took his workpeople into his confidence and showed them how little, except indeed losses, under prevailing conditions the masters were likely to make out of any contracts they might make. He asked them to take lower wages for the sake of getting work at all. Then he put forward a scheme, which seems to me to be the embodiment of what the Socialists want—if, indeed, they are quite clear as to what may be the actual object of their desires. He was willing to let the Trades Unions take over certain yards and work them for the benefit of the men themselves, the heretofore owners being got rid of at a price to be fixed by valuation, and payment to be spread over a number of years so as to render things as easy as possible to the new management. The Trades Unions, however, seem to feel that the responsibility would be somewhat overwhelming under present conditions and a less drastic alternative has now been put forward from the same fertile source. Sir Christopher Furness now proposes to allow the men to take shares in the companies for which they work and to have their interests safeguarded by the introduction of a committee of workmen, who should co-operate with the management. Even this modified scheme seemed to call for deliberation on the part of those to whom it is offered, though, I believe, it has now found acceptance. But at all events, it is the best evidence of the good intentions of the man who has done so much for all classes on the North-east Coast.

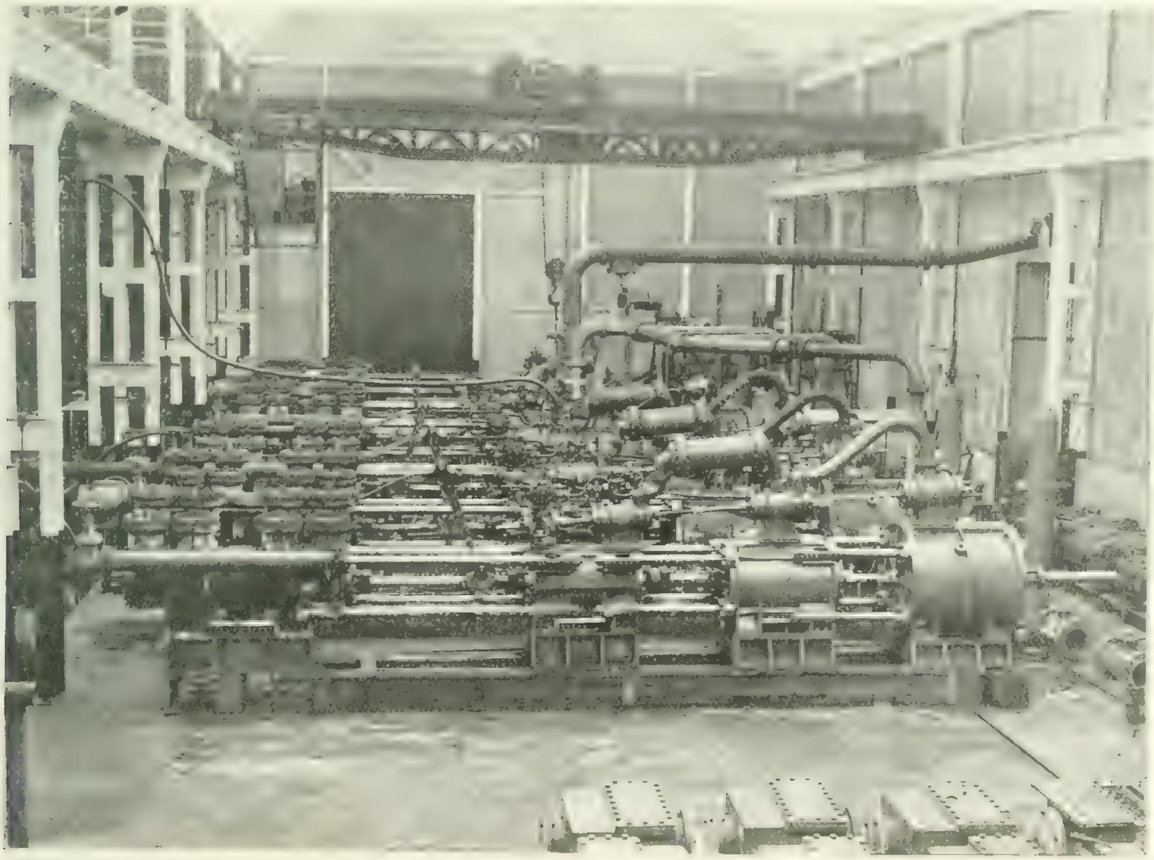
INSTITUTE OF MARINE ENGINEERS.—The first Bohemian concert of the autumn session was held at the Institute of Marine Engineers on Friday, October 16th, on the joint invitation of Messrs. W. Lawrie, John Weir, A. E. Battle and F. Cooper. The honorary secretary, Mr. James Adamson, presided over a large assembly of members and friends, and the excellence of the programme and the appreciative spirit of the audience betokened a continuance of the success which has attended these pleasant social evenings in previous sessions.

MESSRS. W. H. BAILEY & CO., LTD., of Salford, inform us that they have received a repeat order from the Japanese Government for three tide recorders, which are intended to be fixed on the coast of Japan. Each of these recorders will autographically record on a weekly diagram the fluctuations in the tide levels up to 25 ft. The diagram measures 26 in. by 43 in. The diagram drum is driven by a strong eight-day clock, fitted with a 12 in. diam. dial. They are also about to deliver an air compressor to deal with 350 cubic feet of free air per minute for a coal company in India, for working coal-cutting machinery; and they have been awarded three gold medals for their exhibits at the Franco-British Exhibition, for the "Miloscope," a speed indicator for motor cars, for air compressors, steam pumps and patent stop and reducing valves.

WEIR PUMPS IN BURMAH.

THE name "Weir" is familiar to every marine engineer, and there are few working engineers who have not at some time had under their care the pumps and evaporators manufactured by the enterprising Glasgow firm. But though Messrs. G. & J. Weir, Ltd., are best known by their marine auxiliaries, their activities are not by any means confined to this branch of engineering. The wide and unique experience they have gained in the manufacture of feed pumps and service pumps for the onerous conditions obtaining in the navy and merchant service has been turned to account in other directions, and their feed pumps are now at work in most of the up-to-date electric light and power stations and factories in the United Kingdom, and also in many of the best-equipped power stations on the Continent. Their latest achievement in the way of pumping plants, though not directly connected with marine engineering, is yet sufficiently striking to warrant us in bringing some details of the installation before our readers.

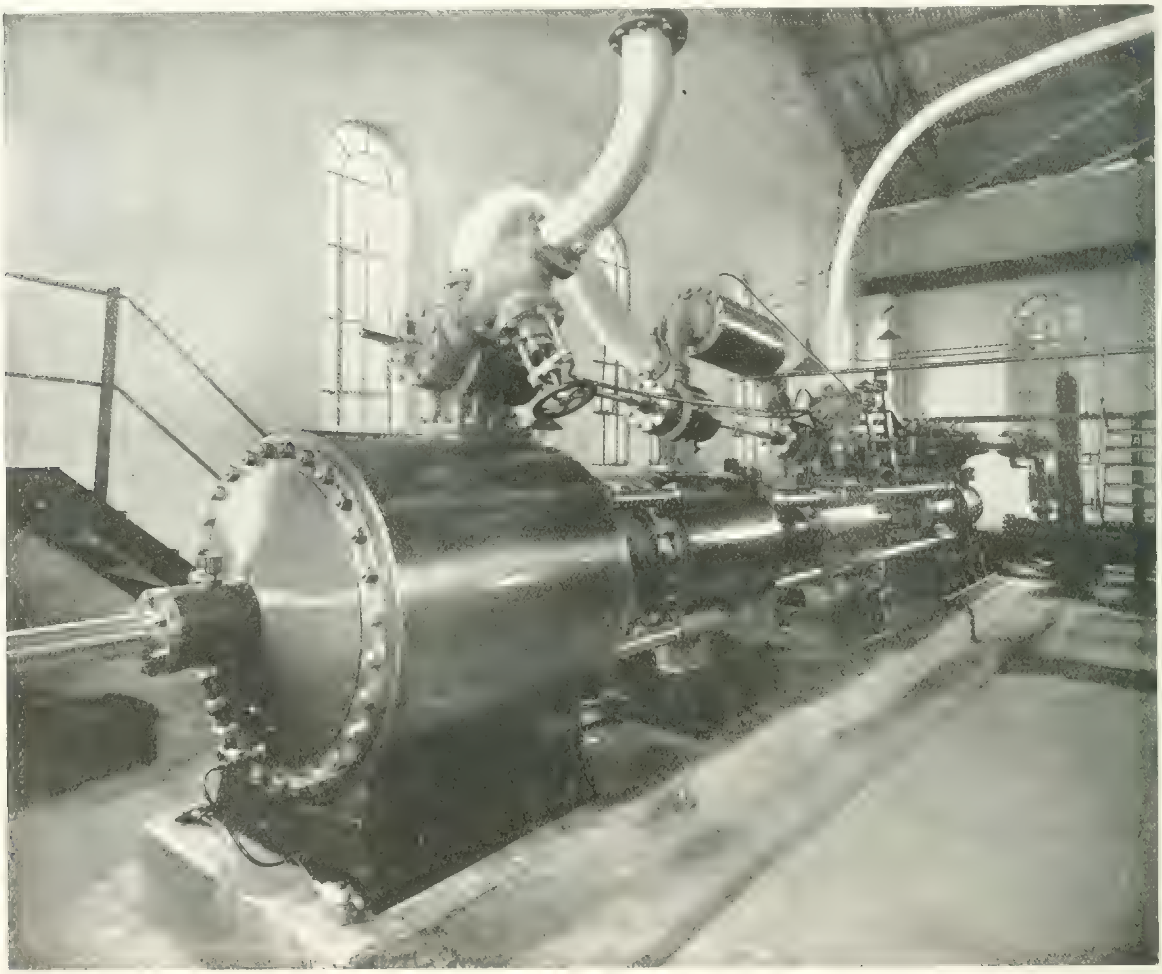
Recently the Burmah Oil Company, Ltd., of Glasgow and Burmah, decided to instal a new pipe line to convey oil from their wells in the interior of Burmah to the coast, a distance of 275 miles. The pumping plants for lines of this kind have hitherto been chiefly furnished by American manufacturers, and they have invariably installed pumps of the duplex type, the objection to the simple pump being the pulsation and fall in pressure which resulted from the pause at the end of the stroke before the reversal of the pump. As might have been expected from their past record, Messrs. Weir were not content to copy what other firms had done, but tackled the problem for themselves. Their consistent advocacy of the single direct-acting pump is well known, and their belief in the superior advantages of this type over the duplex pump, based on their extensive marine experience, led them to seek for some means of overcoming the difficulty referred to above. After long and careful experiment the solution of the difficulty was found in providing air vessels kept at a pre-determined pressure by means of direct-acting air compressors specially designed for the plant. This arrangement has proved entirely successful.



Sets of Weir Pumps for Oil Pumping in Burmah.

The line is 10 inches in diameter and 275 miles long, and the pumping stations are two in number. In each station there are six direct-acting triple-expansion horizontal pumping engines. The steam supply for these is provided by three Lancashire

boilers in each station, working at 160 lbs. pressure, and fed by Weir direct-acting feed pumps. There have also been installed in each station two Weir surface condensers, each capable of maintaining an ample vacuum for three pumping engines working at full load. The air and circulating pumps have also been supplied by Messrs. Weir. These are of the vertical beam type, having air and circulating ends 14-inch diameter by 15-inch stroke, driven by one steam cylinder 10-inch diameter by 15-inch stroke. Each of the pumps works in conjunction with one of the surface condensers, and is capable of maintaining a good vacuum with circulating water that may at times be as high as 90° F.



Weir Pumps in Oil Pumping Station, Burmah

Our illustration shows six of the pumping engines fitted up in Messrs. Weir's works for testing purposes. Each engine comprises a pump end 10 ins. diameter by 30 ins. stroke, of the double-acting inside-ram type, driven direct by tandem triple steam cylinders, $16\frac{1}{2}$ ins., 25 ins., and 38 ins. diameter respectively, by 30 ins. stroke. The steam pressure is 150 lbs. per square inch, and the discharge pressure, due largely to friction, is about 600 lbs. per square inch.

The pump ends, plungers, steam cylinders, pistons and slide valves are of hard close-grained cast iron. The pump-rams work in special cast-iron removable liners. The steam pistons are of cast iron, fitted with Lockwood & Carlisle's Patent Packing Rings. The steam valves are of the piston type in a steam chest separately bolted to each steam cylinder, and are actuated from an actuating steam cylinder controlled by a Weir Standard Steam Valve, which derives its auxiliary motion from the main engine by suitable gear. Each pump has four separate oil valve chests bolted to the pump end. The engines are fitted with steam and exhaust stop valves, stroke counters and all necessary mountings.

The consulting engineers in this contract were Messrs. Jacobs & Barringer, London, and Messrs. A. Gillespie & Son, Glasgow.

Messrs. Morrison & Co., of Valparaiso and 5, Budge Row, London, E.C., have been appointed contractors for stores to the Chilian Navy for a period of five years. The contract covers a large field, embracing engineering stores and supplies, electrical work, chemicals, drugs, surgical sundries, hardware, paints, naval and marine stores, naval accoutrements and equipments, upholstery materials and practically everything required by a modern navy.

NAVAL MATTERS—PAST AND PROSPECTIVE.

(From our Own Correspondents.)

Devonport Dockyard.

I STATED last month that the battleship *Collingwood* would be launched on November [illegible], and it has now been announced that the lady who will name the vessel will be Mrs. Asquith, wife of the Prime Minister. The launch will take place in the afternoon, and being on a Saturday a large number of spectators will no doubt be present. Mrs. Asquith will probably be accompanied by her husband. The *Collingwood* will be the sixth of her class to take the water, her predecessors being the *Dreadnought*, *Bellerophon* and *St. Vincent* at Portsmouth; the *Téméraire*, at Devonport; and the *Superb* being completed by Armstrong's at Newcastle-on-Tyne. It is interesting to note that the *Dreadnought* was on the slip four months, the *Bellerophon* seven months, and the other three vessels eight, while the *Collingwood* will have been nine months. After the launch the slip will be prepared for the laying down of an armoured turbine cruiser of the *Invincible* type, but she will not be commenced until the New Year, probably not until February. The Estimates provide for £140,000 to be spent on the vessel in labour and material up to the end of next March. The installation of the battleship *Hibernia's* wireless apparatus in less than three days, which I mentioned last month, is considered a record performance. The finishing of the wiring work and the preparations for tuning were performed during the vessel's passage to Portland. The *Roxburgh*, of the First Cruiser Squadron, has come in for a refit. She is the only armoured cruiser fitted with Dürr boilers, and as the vessel has been constantly employed since she was completed in 1905 the boilers are to have a thorough overhaul. Her low-power wireless apparatus is to be replaced with high-power instruments and she is to be completely overhauled. The battleship *Repulse* has been docked for the purpose of having her main shafting screw propellers and general under-water fittings examined. The equipment of the cruiser *Leander*, the depot ship for the destroyers of the local division of the Home Fleet, is to be improved by the addition of a foundry which will be mounted in the fore end of the vessel. When completed she will be a repair ship for the destroyers, at least as far as small jobs are concerned. The destroyer *Gipsy*, which is undergoing an extensive refit and overhaul, is to be reboilered, the new boiler being of the small Thornycroft type. Several of the destroyers of the Channel Fleet flotilla are in dockyard hands, among them the *Jed*, which is being fitted with a set of wireless. The work of reconstructing Torpedo Boat No. 99 is practically completed. A sister vessel, Torpedo Boat No. 100, which was built at Chiswick in 1886, having been found to be generally defective, is to be placed on the sale list. There are only about half a dozen of this type now left in the Service. During the cruise of our submarine flotilla there was a mishap somewhat similar to that at Portsmouth a couple of years ago. While exercising in Torbay on October 3rd one of the submarines passed under another vessel, her periscope and conning tower being damaged. Fortunately she reached the surface in safety. The ships of the Home Fleet are still away from port and are not to return until November 1st. The squadron was to have come back at the beginning of October, but bad weather seems to have interfered with the battle practice. Really the vessels of the Home Fleet, so much despised by some of the so-called naval critics, seem to put in quite as much time at sea as the sea-going squadrons. There was a sale here on October 6th, among the vessels disposed of being the obsolete battleship *Alexandra*, lying at Spithead, which fetched £21,750; the third class battleship *Colossus* at the Kyles of Bute £18,500; and the old gunboat *Badger*, which went for £900. The fine old wooden line-of-battleship *Implacable* was to have been included, but the day before the sale the Admiralty cancelled the order! She was originally a French ship named the *Duguay Trouin*, and was captured shortly after Trafalgar by a British squadron commanded by Admiral Sir Richard Strachan off Cape Finisterre. To a large number of those now in the Navy she will be best remembered as the training ship *Lion*. During the last few years she has been lying in the Tamar off Saltash. Captain Ommanney, the King's harbour master of the Hamoaze, and deputy superintendent of the yard, has reached flag rank, but it is not expected that he will leave us until after the launch of the *Collingwood*. It is expected that his successor will be Captain Tuke, who is now in command of the battleship *Victorious*, in the Nore division of the Home Fleet. The Royal Naval Engineering College was inspected on October 14th by Sir Wilmot Fawkes, the Commander-in-Chief. Vice-Admiral Fawkes has just been promoted to full admiral, but he was granted the acting rank of admiral when he came to the port in April last, and he will continue here on his promotion. We have had a visit from the United States training ship *Adams*, which left on October 15th for Gibraltar. A Russian training squadron of two battleships and two cruisers, under the command of Rear-Admiral Lituinoff, has also arrived on a short visit.

Sheerness Dockyard.

A statement has been made that information has been received at Dover that six battleships of the Home Fleet will arrive at that port on January 18th to be permanently stationed, but nothing official has transpired. The fact of the matter appears to be that battleship moorings are being laid in Dover Harbour and are to be completed by that date, but that does not follow that the battleships will be permanently stationed there. Work is plentiful with us. At the beginning of October there were in hand for refit several craft belonging to the Eastern Destroyer Flotilla, as well as the torpedo gunboat *Leda*, which has been detached from fishery duties for her annual refit. Every dock was occupied and there were several ships in the steam basin. The ocean-going destroyers *Mohawk* and *Tartar*, which had been in hand for furnace defects, rejoined the flotilla at Harwich on October 8th and 9th respectively. A sister vessel, the *Afridi*, has returned from Chatham to complete her steam tests. When the engineers were withdrawn from the *Afridi* a few months ago she was sent to Chatham and berthed in the steam basin. The destroyer *Doon* left at the end of September for Portland to rejoin the Channel Fleet Flotilla, from which she parted company three months previously in consequence of an accident to her port propelling shaft. In addition to having a new shaft fitted, she underwent a general refit. The *Ure* has also completed her refit and proceeded to Harwich to rejoin the Eastern Destroyer Flotilla, from which the *Cherwell* and *Wear* were detached at the end of September to go into dockyard hands for their defects to be made good. The *Cossack*, of the same flotilla, which has had her gun platforms strengthened, proceeded to Harwich on October 3rd. The torpedo gunboat *Speedwell*, which fractured the frame of her starboard engine main bearing while on a cruise in the North Sea, has also been taken in hand. Three submarines are in No. 1 dock, this now being reserved solely for that kind of craft. Indeed, there are so many vessels in hand that two of the destroyers of the Eastern Flotilla have had to be sent up to Chatham. The Fifth Cruiser Squadron came back after carrying out battle practice in Scottish waters. The vessels were, however, in harbour only for a few days to give leave, on the conclusion of which they left for a ten days' cruise for night firing and other exercises. On their return some of the vessels will go to Chatham for docking. It cannot be said that the Admiralty err on the side of generosity with regard to their grant to Sheerness Pier, which they have just increased from £50 to £100 a year, subject to some improvements being carried out by the Urban District Council to facilitate the landing and embarking of liberty men. A few years ago the grant was perhaps adequate, but since the advent of the Home Fleet the number of men using the pier has considerably more than doubled. The battleship *Agamemnon* came into port on October 5th with the body of Engineer-Captain R. W. Edwards, of the staff of Rear-Admiral the Hon. Stanley Colville, commanding the local division of the Home Fleet, who died at Cromarty two days previously from an epileptic stroke. The news of Captain Edwards' sudden death was received here on the previous day (Sunday). The first intimation of his illness was when prayers were asked in the Dockyard Church for his recovery, and just after the morning service was over the sad news arrived that he had passed away the previous night. The funeral

took place in the Isle of Sheppey Cemetery, Sheerness, the funeral party consisting of 800 officers and men from the ships in harbour and from the depot, while a firing party of 200 men and the band were furnished by the *Agamemnon*. Engineer-Rear-Admiral Priston represented Admiral Sir Gerard Noel, the Commander-in-Chief, and Rear-Admiral the Hon. A. E. Bethell had charge of the funeral arrangements. There was a large number of wreaths, including one from Devonians at Sheerness. Captain Edwards was for three years on the staff of the Commander-in-Chief at the Nore, and in July last was appointed to the *Magnificent*, on the staff of Rear-Admiral Colville. He was vice-president of the Institute of Marine Engineers.

Portsmouth Dockyard.

The battleships *St. Vincent* and *Bellerophon* changed places in No. 15 dock about the middle of the month. The former vessel was placed in the dock after her launch to have her propellers fitted and the launching fittings removed. The *Bellerophon* was docked for examination previous to leaving for her steam and gunnery trials on October 26th. The gunnery trials will not take place until November 17th and 18th, and on the vessel's return the cabin fittings and furnishing will be got on with. I said last month that the *Gladiator* would probably be in port by the beginning of October. On the 3rd the work of raising the cruiser proved successful and she was refloated and safely towed away from Yarmouth, Isle of Wight, to Portsmouth, where she was docked a day or two later. Captain A. L. Duff, the naval assistant to the Controller of the Navy, and Mr. A. M. Worthington, of the constructors' staff, came here on October 9th, and visited the *Bellerophon* and the *Gladiator*. It is stated that the Admiralty have decided not to refit the latter vessel, which has cost about £54,000 to salve, but in the meantime the hole in her side has been covered with wood. The course to be taken will, however, be decided on when the estimated cost of repairing the ship is known. At any rate, if it is decided to refit her, it will not probably be done at this yard. With regard to refits, the work on the battleships *Britannia* and *Hindustan* has been completed, and another battleship of the Channel Fleet has come in for her annual overhaul. The flagship of the fleet, the *King Edward VII.*, is due in January for the same purpose. The cruiser *Berwick* is another of the vessels in hand. She is to have about £40,000 expended on her, the work to be done including cooling arrangements for her magazines and a new wireless installation in addition to a thorough refit. The old *Victory* will, it is expected, shortly be altered so as to make her look the same as she did when she flew Nelson's flag at Trafalgar. This will be done by painting her hull black and yellow instead of black and white as at present, and her ports vermilion, and also by carrying out other small alterations. A double accident occurred on the night of September 29th, but fortunately no lives were lost. The gunboat *Bouncer* went ashore on Bembridge Ledge and Torpedo Boat No. 026 went to her assistance. While towing the *Bouncer* back to harbour the torpedo boat collided with the steamer *Colombia* from Southampton. The former's bows were buckled and on her arrival she had to be taken into the basin for repair. Some interesting experiments with wireless telephony have been conducted on board the cruiser *Furious* and the destroyer *Vixen* with the object of demonstrating to the Admiralty the possibilities of the system invented by Dr. De Forrest. The vessels have been placed at the disposal of the inventor by the Admiralty, and so far the result has been to prove beyond doubt the possibility of transmitting the human voice from ship to ship over a distance of forty to fifty miles. Some changes have taken place among the engineer-officers at the port. Engineer-Rear-Admiral G. A. Haddy, who had been serving on the staff of the Commander-in-Chief since the beginning of last year, retired at the end of September after nearly forty years' service, and has been succeeded by Engineer-Rear-Admiral J. M. C. Bennett. Consequent on Admiral Haddy's retirement, Engineer-Captain G. Elbrow reaches the rank of engineer-rear-admiral. This officer for the past year had been serving on the staff of Rear-Admiral Farquhar, of the local division of the Home Fleet. A tablet in memory of the late Engineer-Lieutenant Fletcher, who lost his life in the collision which occurred in the spring between the destroyer *Gala* and the scout *Attentive*, will shortly be placed in the Dockyard Church by the officers of the cruiser *Hampshire*, in which vessel Lieutenant Fletcher formerly served.

Chatham Dockyard.

We had a visit at the beginning of the month from Dr. Macnamara, the Financial Secretary to the Admiralty. Mr. Lamb, the member for Rochester, had a long interview with the honourable gentleman, and urged the importance of further dredging operations being carried out in the river, in addition to pleading for a new ship to be included in next year's programme. Mr. Lamb also took Dr. Macnamara for a drive through the principal portions of the town. The honourable member subsequently received from Mr. McKenna, the First Lord of the Admiralty, a letter stating that he will consider the advisability of increasing the shipbuilding done at Chatham when the time for future orders arrives. Mr. McKenna enclosed figures, showing that there are now on the books of this yard 8103 men, as compared with 6637 in January of last year. On October 16th the *Blenheim*, the depot ship for the destroyers at Harwich, came in for a refit, and the same day the cruiser *Dido* completed her refit and proceeded to Sheerness to temporarily take over the duties of the gunnery ship *Endymion*, which is in hand for an alteration of her armament. On October 14th the new armoured cruiser *Inflexible* arrived from Glasgow and she has since been commissioned by Captain Torlesse to take the place of one of the battleships of the *Illustrious* type in the Nore Division of the Home Fleet. The *Inflexible* is the third of the *Dreadnought* type to hoist the pennant for that division. The battleship *Dominion* left to rejoin the Channel Fleet on October 10th, on the completion of the work of fitting her magazine with cooling apparatus. She has also been fitted with high-tension wireless apparatus. There are several other large vessels in hand—the *Indomitable*, which leaves at the end of the month; the *Implacable*, *Formidable*, *Triumph* and *Irresistible*, which are refitting; and the cruiser *Cressy* which came here in consequence of engine-room defects; and the *Dreadnought*, which will be refitted in the steam basin, after which she will go on to Portsmouth for dry docking, as I anticipated would be the case. The work of converting the *Ganges II.* (late *Agincourt*) into a coal hulk is progressing. She is to receive another designation and will in future be known as Coal Depot C 109, which is very like a submarine number. The battleship *Rodney*, one of the dockyard reserve vessels, has been docked to have her hull below the water-line examined and her bottom coated with anti-fouling composition, but no repairs are to be taken in hand except such as may be necessary to keep her afloat. The old battleship *Edinburgh* is also to be brought in for similar treatment. Several vessels of the Eastern Destroyer Flotilla have come in for refits, the *Nith*, *Ness* and *Teviot* arriving on October 10th, and the *Exe* a day or two later. The second of our submarines, C18, was launched on October 10th, the naming ceremony being performed, as in the case of the first, by Mrs. Giffard, wife of Vice-Admiral Giffard, the admiral-superintendent. It was quite a private affair. The Chatham Reform Club, which was a notable institution in its time, recently closed its doors and went into liquidation. It will, however, soon reopen, but not on quite the same lines as hitherto. The building has been acquired by the Wesleyan Army and Navy Board in order to extend the Soldiers' and Sailors' Home, which adjoins. It is to be hoped that the enlarged Home will have a long and useful career.

Pembroke Dockyard.

The *Defence*, having completed her steam and gunnery trials, returned from Devonport on October 1st, the trials being, with the exception of that of the main electrical capstan, completely successful. The latter failed owing to the main shafting becoming overheated. The steam trials were more successful than was expected, but defects showed themselves in the ventilating arrangements of the stokeholds. Various small alterations are to be carried out, including the raising of the funnels some 15 ft. Messrs. Scott, the contractors for the propelling machinery, are to carry out this work. The alteration will make the funnels about the same height as was usual in all vessels previous to the *Duke of Edinburgh*. The building of the ten remaining camels for Dover Harbour will not be proceeded with until after the *Defence* has been completed, it having been arranged

that gangs of shipwrights are to be engaged on the work. Nothing further has been heard as to the camels being sent to Chatham to be constructed. It is not now proposed to complete the *Boadicea* until March 31st next, this being an extension of the period of construction by three months. The cause of the extension is not quite known, but it is believed to be due to the difficulty which would be experienced by the engineers in completing the turbine machinery. Last month I referred to the fact that only one destroyer had been sent here to be refitted, instead of several as was expected would be the case. The captain-superintendent has, however, now received official intimation that the torpedo boat destroyer *Violet* is to be sent to this yard from Devonport about the middle of November to have her machinery overhauled, her boilers retubed, and to be otherwise refitted. This work, the official communication states, has been assigned to us in pursuance of the recent Admiralty decision to make arrangements for keeping the workmen at the dockyards fully employed, and thus to avert a reduction of the staff. Our captain-superintendent, by the bye, is now at the top of the captains' list, and I hear that he is to be promoted to flag rank on November 5th. This, of course, will necessitate Captain Kingsford vacating his post, which he has held for the past two years. The good wishes of all at Pembroke will follow him, and it is to be hoped that "My Lords" will soon give him an opportunity of hoisting his flag.

RICE'S PATENT SENSITIVE DRILLING MACHINE.

IT would appear, judging from the general appearance of the machine illustrated in the adjoining diagram, that some material advance has been made in the design and construction of sensitive drills. This machine forms one of the exhibits of Messrs. Burton, Griffiths & Co., of Ludgate Square, Ludgate Hill, London, at the Electrical Exhibition at Manchester.

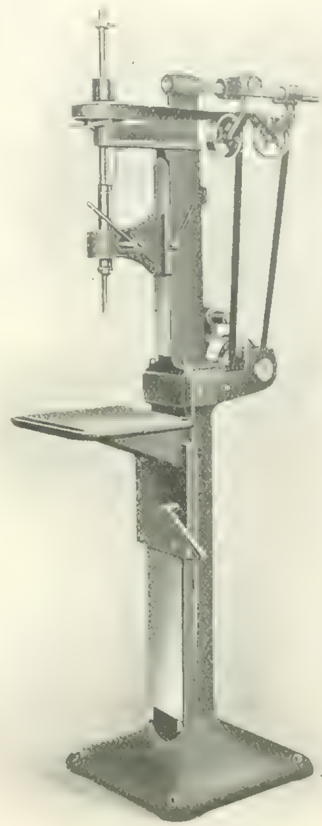
The object sought in the design, besides that of greater output, is that of economy in the upkeep of drills. It is found that in ordinary machines the majority of drill breakages occur where the point of the drill is just coming through the work. In the machine illustrated, owing to the high speed attainable, the drill is enabled to cut its way through the last part of the hole instead of sticking into the work and then breaking.

This result is achieved by a combination of ball bearings fitted to all running parts, roller keys to transmit power from the spindle pulleys to the spindle and by the use of endless belts, the high speed being obtained without increasing the power taken to run these machines over those of the usual construction.

High speed involves risk of vibration. This is avoided in the "Rice" machine by turning the revolving pulleys both inside and outside and by the use of belts of specially supple character. The shocks usually present with ordinary belting are avoided.

It will be noticed that the arrangement of guide pulleys is such that not only is the tensioning of the belts effected by them, but they can be used to compensate for the varying lengths of belt which under ordinary circumstances would be required when running on the different sized pulleys to give variation of speed.

As evidence that these machines take very little power, we are informed that a 1¼-inch belt will drive a machine of multiple form having six spindles, and drill with any one spindle a ¾-inch hole. It would be difficult to find any other so-called sensitive drill



Single Spindle Drill.

capable of boring ¾-inch holes without being too heavy and clumsy to use for very small drills.

THE Council of the Institution of Civil Engineers have made the following awards for the year 1907-1908 :—Telford gold medals to Messrs. W. B. Parsons (New York), and H. Lapworth, D.Sc., (Hathersage) ; a Watt gold medal to Sir Whately Eliot (Addiscombe) ; George Stephenson gold medals to Sir John W. Ottley, K.C.I.E. (London), and Messrs. A. W. Brightmore, D.Sc., (Egham), J. S. Wilson (London), and W. Gore (London) ; Telford Premiums to Messrs. F. W. Davis (Darlington), C. R. S. Kirkpatrick (Newcastle), H. T. Ker (Glasgow), G. H. Scott (London), R. R. Gales, F.C.H. (Bombay), S. H. Ellis (Liverpool), W. Ingham (Port Elizabeth), H. E. Stilgoe (Birmingham), F. P. Anderson (London), H. Berridge (Aden), J. B. Lewis, M.C.E. (Tasmania), A. L. Bell, B.A., B.E. (Coulsdon), and W. S. Harvey (Swansea) ; the Crampton Prize to Mr. P. M. Pritchard (Widnes) ; the Manby Premium to Mr. P. J. Robinson (Hamilton) ; the "James Forrest" Medal and a Miller Prize to Mr. B. P. Fletcher (Newcastle) ; Miller Prizes to Messrs. L. G. E. Morse (London), A. A. Barnes (Manchester), G. O. Case (London), J. H. Forman (Glasgow), A. W. E. Harris, B.Sc. (Birmingham), Ben Howorth (Manchester), H. L. Hunter, B.Sc. (Manchester), P. L. Lascelles, B.A. (Newcastle), G. W. N. Rose, B.Sc. (London), J. M. Rounthwaite, B.Sc. (Newcastle), G. B. Sharples, M.Sc. (Birmingham), and E. I. Shiers, B.A. (London). Bayliss Prizes, awarded on the results of the October and February examinations, 1907-1908 respectively, to Messrs. T. W. W. Parker (Hamilton) and S. C. Gladwyn (Sheffield).

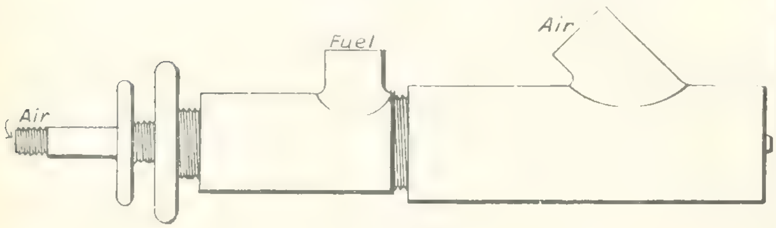
THE "CARBOGEN" OIL FUEL BURNER.

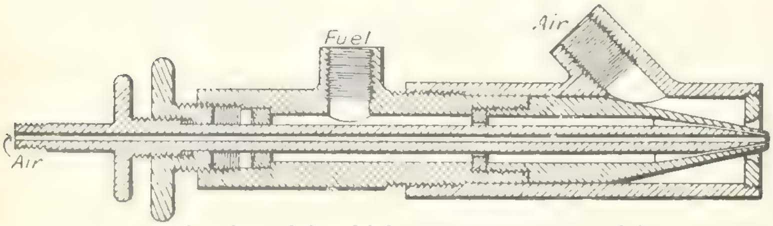
WE illustrate in the adjoining diagram a new oil fuel burner which Mr. S. F. Stackard, of the firm of Messrs. J. A. Curle, Ltd., of Homer Road, South Hackney, London, has designed for the firing of marine boilers.

A practical demonstration of its uses in this direction was given us by Mr. F. May, the Rear-Commodore of the British Motor Boat Club, on his steam yacht, *Dorothy*, of 54 tons, fitted with a 500 h.p. Yarrow water-tube boiler and triple-expansion engines by the Liquid Fuel Engineering Co., of Cowes.

The boiler is fitted with two burners at the firedoor, the only alteration from coal being that the fire bars are covered with tiles, and the burners fire through two combustion chambers of 4½ in. steel barrel about 12 in. long.

The burners are capable of consuming 2 to 12 gallons of fuel per hour with perfect combustion, and the fuel is atomized by means of a Lacy-Hulbert compressor, direct coupled to a small high-speed engine running at a low speed. Each burner requires a volume of 25 c.f. of free air per minute at a pressure of 15 lbs., but both volumes and pressure are adjusted to the rate of fuel consumption.





At the trial, which was very successful, coal was employed to get up steam to a pressure of about 3 lbs., sufficient to operate the fuel pump, when, the burners being lighted, the steam was used for atomization. On attaining a pressure of 15 to 20 lbs., the compressor was started, and the steam replaced by air at the burners.

The *Dorothy* was taken from Greenhithe up and down the river, and at full speed and steaming freely she consumed 12 gallons per hour. Atomization and combustion appeared to be complete, and we are assured that there is no clogging or carbonization of the burner, the crudest form of oil being used.

The burner can be regulated down to about one-quarter of its normal consumption by the movement of the inner tube, which is actuated by a differential screw, and, as shown by the section, the air enters in two places, effecting atomization through the small central hole, and reaching the atomized fuel through the larger hole, just as it is issuing. The air here finds its way out through a fine annulus, and, mixing with the fuel, promotes combustion. A careful adjustment of this opening is necessary, but once effected it is permanent. Hitherto the difficulty has been in procuring liquid fuel, but this has been overcome by the British Petroleum Co., Ltd., who have erected storage tanks capable of holding from 10,000 to 50,000 tons of oil fuel at all the chief ports and manufacturing centres, as London, Manchester, Newcastle-on-Tyne, Barrow-in-Furness, Avonmouth, etc.

MESSRS. HARLAND & WOLFF'S 150-TON FLOATING CRANE.

THIS crane, of which we reproduce a photograph, has been constructed by Benrather Maschinenfabrik, Benrath, and is intended for putting engines and boilers on board the leviathans built at

the Queen's Island. The barge upon which the huge structure is carried is 150 feet long by 86 feet broad over beltings, by 13 feet deep, and contains over 600 tons of ballast. The crane itself is supported on a central pillar, upon the top of which it pivots, the framework of the revolving portion being carried down close to the deck, where it is guided by four pairs of wheels lying horizontally and attached to the base of the pillar. The jib is hinged at about one-third of the height of the structure, the raising and lowering of the jib being performed by a connecting arm attached to

a crosshead which is actuated by two square-threaded shafts. The motive power of the crane is electricity, the generating plant being installed below the deck of the barge, while the motors for the various motions are fitted in a house at the side opposite the jib. All the operations are controlled by switches handled by one man, seated in a glazed house commanding a complete and uninterrupted view of the work to be done. The height of the jib when full up is 235 feet, and there are two sets of blocks—one for loads up to 50 tons, the other for loads exceeding 50 and up to 150 tons. In addition to these there are 5-ton blocks carried on a trolley which travels up and down a girder attached to and carried up the entire length of the under side of the jib. The highest position of the 50-ton blocks at 100 feet outreach over the barge belting is 141 feet, and the highest position of the 150-ton blocks at 57 feet outreach over the belting is 139 feet. The working speeds are as follows:—Hoisting 150 tons, 5 feet per minute: 100 tons, 7 feet per minute; 60 tons, 11 feet per minute; 50 tons, 13 feet per minute; 20 tons, 30 feet per minute; and 10 tons, 36 feet per minute; while the 5-ton blocks hoist at the rate of 60 feet per minute, and the trolley travels at the rate of 120 feet per minute. The time occupied in slewing 150 tons through a complete circle is about 5½ minutes, and the derricking of the same load from 57 feet radius to 29 feet radius can be performed in about 7 minutes. With no load the jib can be raised the same height in about 4 minutes.

The crane has been put through a complete series of tests up to a maximum load of 200 tons, the various trials having been, we understand, carried out to the entire satisfaction of all concerned.

ELECTRICAL NOTES.

(From our Own Correspondent.)

Arc Lamp Carbons.

As the arc lamp of the present day is a very ingenious piece of mechanical and electro-magnetic work, so the arc lamp carbon is also worthy of consideration. If two lengths are placed contiguously together and an electric current passed through them at sufficient voltage the points of contact will become hot, and if the carbons are then separated the air space between will be filled with carbon vapour, and an arc struck. Of the various types of lamps on the market this theory is common to all. What, then, are the carbons and how are they made? They are chiefly graphite powder pressed into a mould and mixed with an adhesive substance, the positive carbon being made with a crater and the negative pointed. To strike an arc an E.M.F. of about 45 volts must be employed, but with the arc once struck a pressure of much less is sufficient to maintain the current, usually 10 ampères, due to the molecular disintegration of the carbon. It is found that this drop in voltage is due to the work of overcoming the molecular disintegration of the carbon particles which establish a counter E.M.F. between themselves and the positive carbon. There is a drop from 45 to about 7 volts, and this is the way it is accounted for. It is this volatilisation of the positive carbon and in a lesser degree of the negative that answers for the phenomenon. The requirements of carbon which are seen to be important are that the electrical resistance should be low. Positive carbons are generally cored and filled with plumbago, which volatizes more readily than the surrounding carbon which assists the arc. The carbons are each about a foot long, and this is why the resistance has to be low. Then there is the feeding mechanism, which requires power and raises the voltage to about 50. Where, then, the installation is of a higher power the lamps have to be placed in series or have a resistance inserted to take up any extra pressure. For instance, if there were 120-volt pressure on the above figures and two lamps being in series, there would be a surplus of 20 volts for which a resistance would be required, which has to be carefully calculated to be exact in quantity. The efficiency of arc lamps is usually high, about twice that of incandescent lighting. The question of the purity and make of carbons has a good deal to do with this question of efficiency, as might be imagined.

Lift Gates Safety Appliances.

Lifts on first-class liners are comparatively common now, and here as on shore the necessity of a safety appliance for locking the gates is much to the front. These are partly mechanical to prevent the gate being opened unless the cage is on a level with the floor and consist of a sliding bolt operated by a cam attached to the car. By this, however, a gate could be opened as the car has left the floor, and therefore a form of electrical lock is necessary, making it impossible to move the cage unless all the doors are locked and closed, and in this case the lift is operated by a switch fixed inside the car, a form of electric solenoid being used to start and reverse the motor, and in such cases it is only necessary to fit switches to each gate so that the opening of the gate also opens the switch and connects all the gate contacts in series with the main solenoid windings. It will then be impossible to work the lift with any gate open as there is an open circuit. There is also an apparatus used, a push-button control, which comprises a set of pushes at each gate corresponding in number to the numbers of gates. Pressing the button corresponding to the floor at which the passenger waits automatically brings the cage to that floor. The passenger opens gate, which has been released by the arrival of the cage, steps in and closes gate. He then presses the button corresponding to the floor at which he desires to alight. He again stops at required floor, opens gate and, alighting, closes gate after him. In this system, however, if the passenger neglects to close the gate the whole system is stopped, which is evidently a drawback, as will be seen.

Metallic Filament Lamps.

A paper was recently read before the Institute of Electrical Engineers on this subject, from which it is inferred that the new lamps will raise the general standard of illumination, and indeed we might almost say it has already done so. The reason is the difficulty of making lamps of small power, though when a small voltage below 110 is used, there is not the same objection. Osram lamps for 25 volt circuits have been standardized for both 10 c.p. and 16 c.p. The lamps consume 10 to 16 watts and give the same candle power as the ordinary carbon filament, taking 40 to 60 watts. It is difficult to use these low-voltage lamps with continuous current available from mains, as there is the reduction to be done. With alternating current and transformer it has been found, the paper says, that there is over 50 per cent. saving, but with continuous current the extra cost of reduction will not pay, unless it is for large sets, because it is required to use motor generators and converters, which is not the case with alternating current, as in that case static transformers are used and no rotation required. Figures were furnished in detail and the discussion supported the main issue of the saving effected, but as we have said on a former occasion, the commercial side of the question and first costs do not always receive due attention in the reading of scientific papers.

International Conference on Electrical Units and Standards.

A conference with the object of settling the important question of electrical units and standards has been holding meetings at the Royal Society Rooms, at which twenty-one countries were represented. The president of the Board of Trade welcomed the delegates and nominated Lord Rayleigh to the presidency of the conference. Such a meeting should do much towards settling any differences that may be existing on electrical matters.

LECTURE ON THE CORROSION AND DECAY OF METALS.*

Continued from page 80.

By Mr. J. T. MILTON (Member of Council).

It is, however, perhaps from the differences of temperature of different parts of the vessel that the most serious results ensue on board steam vessels. It is a well-known experimental fact that, given two pieces of the same kind of metal electrically connected, but at different temperatures, the warmest will always be electro positive to the other, and if both are in the same corrosive medium a current will flow from one to the other. It is in the double bottoms under the boilers that this finds the greatest illustration. Here we have all the conditions for corrosion. The upper part is heated by the boilers, the lower plates are kept cold by the sea. They are in communication by the floors, etc., and are surrounded either by sea water when the tanks are full, or by moist air when they are so-called empty. A current is set up and corrosion occurs. The remedy appears first to as much as possible prevent the differences of temperature by preventing the heat of the boiler from reaching the ship structure, and second by ensuring that there is no corrosive medium either of sea water or moist air in these spaces. This can only be done by ensuring that the spaces are kept absolutely dry. Thirdly, by paying particular attention to keeping these parts thoroughly protected by paint inside, and by paint or other means outside. These points are given much more attention to now than formerly, but they are so very important that they will bear repeating and emphasizing.

Another part of the vessel to which the same differences of temperature must affect the structure and set up currents is in way of refrigerating spaces. The parts of the vessel hidden from view behind the insulation are kept cooler than normal, and so they tend to be preserved instead of corroded; moreover, they are kept dry instead of moist, and on these accounts they do not corrode or give undue trouble or anxiety. The same influence of differences of temperature can often be seen in boilers. For instance, the shell of a donkey boiler, if corroded at all, will be found to be corroded on the side nearest the main boiler chimney, and to be free from corrosion on the other side.

So far we have spoken of corrosion as due to the action of a corrosive liquid or medium on the metal, either under normal conditions, or intensified by electric current so arranged that the current leaves the metal to enter the corroding medium. Now for a moment consider the reverse action. Turning to our original experiment, we saw that if both the plates were by themselves corrodible in the liquid, when electric contact was made the one which was least corrodible was protected by the arrangement, and we also saw that it was not necessary to have two dissimilar metals to make the one corrode; a current, however generated, was sufficient to affect the same purpose, provided it was made to leave the metal. Now let us reverse the direction of the current, and we shall find that, provided it was made to *enter* the metal from the liquid, corrosion is stopped. This experiment shows that electric currents may be made to protect as well as to corrode.

So far our remarks have all been made to apply to the case of a metal of homogeneous structure, that is to say, of which each and every point has the same physical properties. Let us see what will happen if the metal is not homogeneous. No metals are absolutely pure. When two or more elementary substances are mixed together we produce either one of three different kinds of arrangement of the individual particles. We may have a mechanical mixture, in which each individual particle of each substance has retained its own individuality and is merely mixed up with the other particles, and if we had patience enough we could again separate each from each, as in a mass of iron and brass filings mixed together as intimately as possible. Each particle of iron remains iron distinct from all the particles of brass, and the use of a magnet will be sufficient to again separate all the iron from the mixture.

Next we may have a chemical combination, definite numbers of atoms of each component unite together and form an altogether different substance with physical properties other than either of the component parts. A chemical combination has the property that each part of it, however minute, contains precisely the same proportion of each constituent as every other part, whereas in a mechanical mixture we may have very considerable variations of the different constituents when we closely examine very minute parts of it.

Thirdly, we have what is called a solution, as, for example, a solution of salt in water. Here we have, when carefully examined, the same proportion of salt and water in each and every part, but the proportions, instead of being definite as they are in a chemical compound, may be anything ranging from the very smallest amount of the dissolved substance up to that particular amount which saturates the solution. (Under certain peculiar circumstances it is possible in some cases to have a supersaturated solution, but this is always a condition of unstable equilibrium). We not only may have liquid solutions, but the same equable distribution of the one substance within the other if in the solid state is also called a solution, but in this case it is generally called a solid solution. The three states of distribution of different elementary substances then are: (1) Chemical compounds distinguished by every part, however minute, being composed of precisely the same definite atomic proportions, and consequently homogeneous; (2) solutions in which each and every part also is composed of precisely the same proportions, and the substance is therefore still homogeneous; but these are not atomic proportions and may be varied indefinitely below the maximum or saturated condition of any one of the constituents; and (3) mechanical mixtures in which, when minutely viewed, the substance is not homogeneous, small measurable portions being composed wholly of one constituent and others of other constituents.

When we come to closely examine metals we find in them all three forms of these arrangements. As an example of a chemical compound let us take a yellow brass composed of about two atomic parts of copper to one of zinc. If the copper is first melted in one crucible and zinc added, either by being separately melted and poured into the copper, or even put as a solid into the molten copper, combination takes place with the evolution of a considerable amount of heat, and the resulting metal is altogether different from either of its constituents. It is perhaps not so ductile as the copper, but is immensely more so than the zinc. It is a different colour from either of them and is stronger than either. Whereas copper can be worked either hot or cold, this cannot be worked hot—in fact it is a different metal altogether. If instead of taking two parts of copper to one of zinc we take about equal atomic quantities, and treat them in the same way, we obtain another chemical compound. Like the other it is yellow, harder than copper, and possesses considerable ductility, and is altogether different in its physical qualities from either copper or zinc. It is a true chemical compound.

Now instead of taking either of the proportions named, suppose we take some intermediate proportion, say, 60 per cent. copper and 40 per cent. zinc, which is the composition of the alloy so well known under the name of "Muntz metal." We still, on mixing the molten metals, obtain chemical action with the evolution of heat, but what really takes place is that we get actually a mixture of the two chemical compounds, Cu_2Zn and $CuZn$. There is not enough zinc in the mixture to make all $CuZn$, nor is there enough copper to make all Cu_2Zn, so when equilibrium is obtained there is a mixture of these two constituents in such a porportion that every atom of copper and every atom of zinc is combined in one or other of these proportions. While the resulting metal is fluid, each of the components is mutually dissolved in the other and we have a homogeneous solution of $CuZn$ in Cu_2Zn, or of Cu_2Zn in $CuZn$, whichever way we choose to view the matter. If now the mass can be cooled very suddenly we are able to retain the two constituents in their homogeneous solution, and we have a homogeneous solid solution as a result. If, however, the cooling is allowed to take place more slowly, then each of these metals separates out from the other, and the result is that we have a mechanical mixture of the two constituents. Here then we have in one alloy, "Muntz metal," an exemplification of two different chemical compounds, each differing from the constituent metals, of solid solution of one of them in the other, and of a mechanical mixture of the two chemical compounds, the condition of solid solution or mechanical mixture being solely in this case

*Delivered in the Congress Hall, Franco-British Exhibition, Sept. 5th, Mr. Alexander Boyle (Vice-President) in the chair.

due to the conditions of cooling from a high to ordinary temperatures. Actually the separation of the two constituents takes place at a temperature lower than that of solidification, so that here we have a wonderful instance of the transference of solid metallic molecules through the solid occurring during the "segregation," of the different constituents. This is a subject which has not been fully investigated and is outside the scope of the present lecture, but some illustrations will be given to show what actually takes place, as the mechanical mixture or separation of these two metals has a distinct bearing on our subject.

The actual mixture of the two constituents is shown by the microscope. Both the compounds are of the same yellow colour. When the metal is cut it appears to the eye as homogeneous, and when it is carefully polished and microscopically examined it still presents the appearance of a yellow mirror-like surface with no markings whatever on it. Let it now be lightly etched with acid, and we find definite marking on it, certain portions of the surface become darkened whilst others remain bright. What has happened is that the acid has really commenced to dissolve the surface of the CuZn portions, leaving that of the Cu_2Zn untouched. How we recognise each constituent which we see is by taking several samples of alloy varying in composition from CuZn to Cu_2Zn; treating them all in the same way, we find that the CuZn alloy is composed entirely of the dark etching constituent, the Cu_2Zn entirely of the other, while in those alloys of intermediate composition there is always a mixture of the two substances, and the proportion of them varies just as the composition would lead one to expect.

Now returning to the question of corrosion. The etching by the acid which reveals the structure is simply a case of corrosion. Here we have two distinct metals, each by itself corrodible by the acid. They are in excellent electrical contact and are both immersed in a corrosive medium. Galvanic action ensues, the one least corrodible is preserved through the contact with its neighbour, which, however, is more vigorously attacked and eaten away by the acid. So far the matter is simple, and explains what used to be considered so very mysterious, the decay of Muntz metal and somewhat similar alloys when exposed to the action of sea water. Some examples of this decay are here shown. There were exhibited portions of a Muntz metal condenser tube plate and of a Muntz metal diaphragm plate, some specimens of decayed yellow metal bolts taken from wooden ships, some brass bolts taken from a circulating pump chamber, and a metallic air pump valve. The latter, though apparently sound, can easily be broken by hand.

It will be noticed that in each case where a decayed piece of metal has been broken the surface appears to be dull and non-metallic; where, however, the piece is filed it has a yellow metallic appearance, giving practically no indication of its actual character, although a careful comparison with a piece of sound metal similarly filed will show a distinct difference in brightness. How is this to be accounted for? If we take as an illustration a wall built with red bricks and white mortar, and supposing the bricks are stronger than the mortar, if the wall is broken down by force the ruptured surfaces will show principally the white colour of the mortar. If, however, the wall is sawn through or carefully cut right through the bricks withont dragging any of them out bodily, the fracture will show mainly the red colour of the brick. It is similar in the case of the decayed Muntz metal. In the sound metal the two constituents are mixed up mechanically, One of them then becomes decayed, and is represented by the mortar of the illustration, the other remains practically sound and is represented by the bricks. On fracture by blow the rotten portion gives way, and we observe its colour as dull brown, but on filing the metal some of the sound portions are filed through and we get the bright metallic appearance. It may reasonably be asked why is it that in some cases the metal which decays or corrodes seems to do so in a different manner from that shown in the specimens exhibited, and disappears entirely without preserving its outward form? The explanation is probably to be found in the variation of the *intensity* of the corrosive influence. Where there are no extraneous electric currents to assist in the corrosion, but only the action of pure sea water, then the decay is slow and affects only the one constituent. It probably consists of a slow oxidation of the zinc, leaving the copper in an extremely finely divided metallic state. The zinc oxide in part must get dissolved away, because the total volume of the decayed metal and oxide is only equal to that of its original bulk, but in part it surrounds the minute pieces of copper left and partially insulates them. If, however, there is in addition to the chemical action of the water, an added electric current, the action may be sufficiently strong to oxidize not only the zinc but also the copper, and the effect of the current then falls on the other constituent, and it also begins to oxidize and decay, with the result of the formation of a pit hole or the loss of original shape. If the added electric current is strong it may actually from the first overcome the protective influence of the CuZn on the Cu_2Zn, and then corrosion of both constituents will take place simultaneously. The case of Muntz metal has been taken because of the simplicity of its structure and the striking effect of the corrosion or decay to which it is sometimes subject, and it is, therefore, an example of what may be expected when a heterogeneous metal is subjected to corrosive influences.

The effect of impurities in metals may be inferred to be that if the impurity is of a nature to be dissolved uniformly into the metal so that the impure metal is homogeneous, local currents will not be set up at all, and the impure metal will be only subject to corrosion pure and simple, and will either tend to be preserved or to be more rapidly decayed according to the effect the impurity has. For instance, take a brass which has not a duplex structure as in 70-30 condenser tubes. If there is a little tin in it, either as an impurity or intentionally added, the tin diffuses uniformly through the metal with the effect of retarding or diminishing corrosion. If, however, the impurity be a small proportion of lead, it also will be diffused or dissolved uniformly through the brass, but its presence will render the brass more corrodible. When we come to more complex alloys, we in general get a still more complex structure than in ordinary Muntz metal. Most of the special bronzes used for propellers, etc., owe their strength to the iron they contain. They are mainly copper-zinc alloys of the Muntz metal type, with a small proportion of iron, tin and sometimes of other metals. The tin appears to go into solution with one or other of the constituents, and cannot be separately observed. The iron probably combines with some of the zinc, and the compound dissolves in the metal so long as its proportion does not exceed that at which the metal becomes saturated, which I believe is with about 1 per cent. iron. When, however, the iron exceeds this 1 per cent. there can always be seen in a prepared polished section of annealed metal numerous small points harder, and different in colour, than the rest, these contain the excess of iron combined most probably with zinc. When etched such points are the first to be attacked and dissolved. These bronzes do not always behave in the same manner. In iron or steel vessels they generally last well. In several composite vessels with coppered bottoms the bronze propellers made for the different vessels by different makers all behaved in the same way; they became dezincified on the surface. In the first case noticed this was attributed to the vessel lying for a long time in impure river water. The propeller was filed bright and the ship was then employed in deep sea water, and it was found that the same thing occurred in the new conditions; so also on subsequent vessels. In iron or steel vessels this kind of action has scarcely ever been noticed; it was, therefore, reasonable to infer that it was due to the exceptional circumstances of the vessel being coppered. In fact the bronze propeller and the copper sheathing immersed in sea water formed a galvanic battery.

Cast iron is well known to suffer severely from decay in certain conditions, although in other conditions it remains good for apparently an indefinite time. It is perhaps the most complex in structure of all the metals used in every-day work, as it is the most varied in chemical composition. Every known brand of pig seems to have a different composition, depending on the ores from which it is smelted, while even from the same blast furnace working with the same coke, ore and flux, different grades of pig are produced. In all cast iron we have, besides iron, a considerable proportion—sometimes as much as 3·5 per cent.—of carbon, some of which may be combined with iron, forming carbide of iron, whilst the remainder exists as graphite; we always have also present in various proportions silicon, sulphur, phosphorus and manganese, all of which are recognised as ordinary constituents, and often we have other elements, such as copper, arsenic, etc., as well, which are looked upon as impurities.

Each of these elements, according to its amount, influences the physical properties of the iron. When the iron is molten the whole of the elements, however they may be combined amongst themselves, must be in a liqnid form uniformly diffused through the mass, and the molten cast iron is mainly homogeneous. On cooling, the first to solidify and to separate out is some of the carbon, which separates out in plates or partly spherical shells of graphite. If the cooling is very slow these graphite plates separate out in larger sizes than where the cooling is more rapid, and the iron is more grey and soft. Next, other parts separate out. The silicon combines with iron and manganese, forming silicides. The remainder of the carbon combines also with iron and manganese, forming carbides. The sulphur combines with some iron, forming a brittle slag-like substance, FeS, iron sulphide, which separates out in small particles throughout the mass, and finally the portion which solidifies last is a compound of iron and phosphorus. When cast iron is carefully prepared for examination by polishing, the graphite plates can be clearly seen, even with small magnification, as can also the small particles of iron or manganese sulphide, but the rest of the materials remain bright. By etching, however, and by heat tinting, the different constituents can be seen and recognised, and it is found that the phosphide of iron is always at the greatest distance from the graphite flakes, occupying, it may be said, the centre of the spaces between the flakes. In this complex metal we have the very conditions for galvanic action to be set up directly a corrosive medium envelops the cast iron. The minute graphite plates are not readily oxidizable, they immediately become the minute poles of a multitude of miniature galvanic batteries. The phosphide of iron also appears to be very resistant of oxidation, so that the parts of this constituent probably serve as poles of other minute batteries. At any rate we have every condition for a rapid oxidation of the surface. It is only too common to find iron castings which have been subject to the influence of sea water softened so that they can be cut with a knife, and in this condition they are generally said to have been converted into plumbago. By carefully preparing a section of a wasted casting at the junction of the sound and unsound portions, it can be seen that the decay first attacks the iron at its junction with the graphite plates ; it then advances along the plates, and gradually proceeds through the metallic portion surrounding the plates, leaving the phosphide compound till the last. Moreover, it is found that these phosphide portions have not only been left to the last because they have been the last attacked, but they are left intact in parts which have evidently been decayed for a long time, so it is clear that they themselves offer great resistance to corrosion. So far we are considering corrosion of cast iron by itself, but it will be seen that given in addition a galvanic current in the right direction from an outside source we need not be surprised at the rapid rate at which corrosion will occur. If the corrosion is simply oxidation, then iron oxide, being practically insoluble in water, will itself form a thick coating of rust on the cast iron, which, although it will probably transmit oxygen through itself and lead to further oxidation, will not in any way account for the plumbago-like condition in which decayed cast iron is sometimes found. To account for this it is evident that plain oxidation is insufficient and that there must be, in some way, other corrosive influences which permit of a solution or partial solution of the products of decay and the consequent removal of some of the iron. An analysis of some of the plumbago-like substance formed by the decay of cast iron is given here :—

Iron	43·0
Graphite	7·8
Silicon	4·66
Phosphorus	3·08
Sulphur	·50
Manganese .	·31

From this it is clear that whilst all or nearly all of the carbon, silicon and phosphorus have been retained, fully one half of the metallic iron has been removed, whilst the remainder of the iron is partly reduced to the form of oxide. Such a result will probably be accounted for by the formation of chloride of iron through the action of galvanic currents and sea water.

We may say that whereas cast iron consists of iron with a large proportion of carbon, steel consists of iron with a considerably less proportion of carbon, while wrought iron is iron containing no carbon, that is, it is spoken of as being pure iron. It is the general experience that, given the same exposure to corrosive influences, high-class wrought iron, such as Lowmoor, Bowling, etc., rusts more quickly than the more common iron used for ship and bridge plates, and that mild steel corrodes more quickly still. In cast iron much of the carbon exists in the form of graphite, but in the case of steel all the carbon exists in a combined state, either as Fe_3C, Mn_3C. The carbide itself becomes very intimately mixed up with a definite proportion of iron ; the mixture of iron and carbide is called " Pearlite," and this mixture is such that the percentage of carbon in it is ·9. In steels containing less than ·9 per cent. of carbon—comprising all structural steel—it is found that the carbon all exists in definite areas of pearlite, leaving the remaining parts of iron free from carbon. This pure iron is called " Ferrite." In steel containing ·9 per cent. carbon, such as chisel steel, we get the whole structure comprised of pearlite. In steel containing ·45 per cent. carbon, half of it will be pearlite and half ferrite. In steel containing say ·22 per cent. carbon, such as some boiler-plate steel, we get about a quarter of the whole area pearlite, and the rest ferrite, and generally the amount of pearlite is proportional to the amount of carbon in the steel. In steel containing a greater proportion of carbon than ·9 per cent., such as some tool steels, the structure consists of pearlite and carbide, which is then called " Cementite."

Now let us take two polished specimens of steel, one containing less than ·9 per cent. carbon, and the other more. One will consist of ferrite and pearlite, the other of cementite and pearlite. Etch both of the specimens in dilute acid, and in both cases the portion first acted on is the pearlite. After considerable action has taken place in the pearlite then the ferrite in the low carbon steel is commenced to be attacked, but the cementite in the high carbon steel escapes action. The explanation here is galvanic action. The carbide of iron is electro negative to the ferrite, and so in the pearlite where the two constituents are in close juxtaposition the carbide is not acted on, but the ferrite, is rapidly dissolved. This leaves the surface rough, and it therefore shows up dark coloured under the microscope. After a time the acid has eaten most of the exposed ferrite out of the pearlite, leaving only its carbide to be acted upon, then the action commences on the adjoining crystals of ferrite, and they commence to dissolve in the case of the soft steel, but in the case of the high carbon steel, where there is no free ferrite, the action is still confined to the pearlite. Now instead of the acid used for rapid etching let us assume ordinary oxidation to be taking place. In the chisel steel we have the substance practically all pearlite. It oxidizes quickly at first by reason of the iron in the pearlite, but the pieces of carbide hold the rust so formed, and the action is rendered slower. In the mild steel we have the innumerable small galvanic batteries formed by the pearlite and ferrite in juxtaposition, and consequently the metal oxidizes rapidly by galvanic action, and the action will be quickest when the proportion between the pearlite and ferrite is that which gives the greatest intensity of local current. Consequently mild steel corrodes more quickly than the harder steel used for tools.

We have in the Lowmoor irons, known as " steely " irons, a metal containing only a small quantity of carbon, and we find in it small patches of pearlite, just enough to set up some galvanic effect, and consequently in their case we get less rapid corrosion than in mild steel, but still more action than there is in the commoner irons, which contain scarcely any carbon, and which are known to rust less rapidly than the better-class irons and structural steels. Manganese is a very oxidizable metal, and it is only what would be expected that steel comparatively high in manganese should corrode more rapidly than that in which it does not so much predominate. Sulphur also, when it is in steel, seems to exist mainly in small isolated particles of sulphide of manganese situated in the ferrite, but Mr. Stead has found that some of the sulphur becomes dissolved in solid solution in some of the ferrite, and it is then by no means uniformly distributed through the metal. The parts where it is segregated are called " ghosts " by microscopists, and they corrode or etch much more quickly than the rest of the metal, probably again by galvanic action. Sulphur, then, as well as manganese, is objectionable from the point of view of corrosion. The effect that phosphoros and silicon play in regard to corrosion is not known with certainty.

What has been said about local or stray currents existing in a ship may not appear to be quite clear. It may be easily appreciated that in a case where there is powerful electric machinery, leakages from the electric mains may set up local currents; but even then the matter seems obscure and requires a deal of, shall I say, faith to believe, that these leakages are the cause of corrosions at a distance from them, and technical skill of a high order is required to trace out the connexion; but when we come to a cargo steamer without electrical appliances, it does not seem unreasonable to say, "How can these things be?" but that such currents do exist even in such cargo steamers I will now proceed to show. We have seen that when a current is made to flow from a surface into a corrosive medium, corrosion is set up. In electro plating, and in the electro depositions of metals, we have the current made to flow from the anode through a liquid to the cathode. The liquid is a solution of a salt of the metal required to be deposited on the cathode. The anode is made of the same kind of metal it is desired to deposit. When the current flows, the salt of the metal is split up. The metal is deposited on the cathode and the acid is formed on the anode, where, meeting the metal, it unites with it, re-forming an equal amount of the salt to that which was split up. If, however, the anode were made of an incorrodible substance, the splitting up of the salt in solution would still take place with the corresponding deposition of metal on the cathode, and this would continue until all the salt was used up. If now we find that electro deposition of a metal takes place, we are sure that there must have been electric currents to effect this.

My attention was drawn two or three years ago to the case of a cargo steamer, then four years old, with no electric light fittings, and with a cast-iron propeller. The screw shaft was fitted with a continuous gun-metal liner, and it had not been drawn since it was fitted. It was very difficult to get out, and was found covered at the parts between the stern tube bearings with a hard brownish scale of a greater thickness than the reduction of radius of liner which had been made between the bearing surfaces. Some of this scale was submitted to me, examined microscopically and found full of bright metallic spots, apparently of copper. The scale being analysed, was found to have no less than 14 per cent. of pure metallic copper, and the remainder mainly *carbonate*, not *sulphate*, of lime. There was a little iron in it, probably as iron oxide, but no zinc or tin. Where did the copper come from? The stern tube was of cast iron. The only possible source of the copper was the gnn-metal liner of the shaft or the gun-metal of the stern bush. The liner, however, was found to be perfectly sound under the scale, and perfectly sound and bright where working in the lignum-vitæ bearings, and the metal of the bushes was not in any way wasted. Minute examination of the scale showed that the copper and the calcareous parts of the scale had been deposited concurrently. At first multitudes of very minute crystals of copper had been deposited on the gun-metal liner, whilst the spaces between them had been filled up with scale; further depositions of copper had taken place on some of these first crystals, and more scale had been deposited, some of the crystals becoming buried up in the scale. Then those still unburied got more copper deposited on them; then some of them got buried up in scale so that in time the exposed copper crystals became much fewer in number than at starting, and the whole scale began to take on a nodular appearance. Some samples of such scale were exhibited. The explanation of the presence of the copper appears to be that the rotation of the shaft rubs off exceedingly minute particles of the gun-metal which become dissolved in the water in the stern tube, probably as chlorides of copper, zinc and tin. The solution becomes electrolyzed by a current which, wherever it comes from, leaves the water and enters the gnn-metal liner, depositing the copper in so doing, but leaving the zinc and tin chlorides unacted on in accordance with the well-known law that with weak currents only the most negative metal is deposited. This is not by any means an isolated case, for in several cases since I have had similar scale brought to me from continuous liners, and in every case I have found a considerable amount of metallic copper in the scale. In each of these other cases the propellers have been manganese bronze, and there has been electric machinery in the ships; but in the first case the propeller was iron, and there was no electric light, and yet there was an undoubted case of electric current, for this alone could account for the electrolytic deposition of the copper.

The next case I will refer to shows the obscurity of the problem, as it appears that at some time or other, in this particular case, the current became reversed. In a circulating pump the bucket was gun-metal, the rod was naval brass. Water got in between the cone of the rod and the bucket, and the naval brass, which is a copper, zinc, tin alloy of the Muntz metal type, became dezincified on the surface, the zinc and tin vanished and the copper was at first left in the usual spongy form. The rocking of the bucket on the rod, however, hammered up the spongy copper into films, more decay took place, more sponginess occurred, to be again consolidated by the rocking of the bucket into films, and so we obtained the laminæ exhibited; but at some time or other something else occurred. Some of the copper must have got dissolved, and the current becoming reversed, the copper was re-deposited on one of the laminated pieces of spongy copper in a beautifully crystalline form.

After the lecture a decayed pump-rod was exhibited by Mr. Docherty. In this rod the decay had penetrated for a considerable distance into the rod, and there was a core of apparently sound metal remaining. It was stated that in this case also some of the copper had become re-deposited electrically on the upper part of the rod.

Messrs. Wailes, Dove & Co.'s "Bitumastic" enamel was applied to the bunkers and fore and after peaks of the s.s. *[illegible]*.

Messrs. Wailes, Dove & Co.'s "Bitumastic" enamel was applied to the peaks, cofferdams, engine and boiler-room tanks, and their "Bitumastic" covering to the tank tops in engine and boiler rooms of s.s. *Cheyenne*.

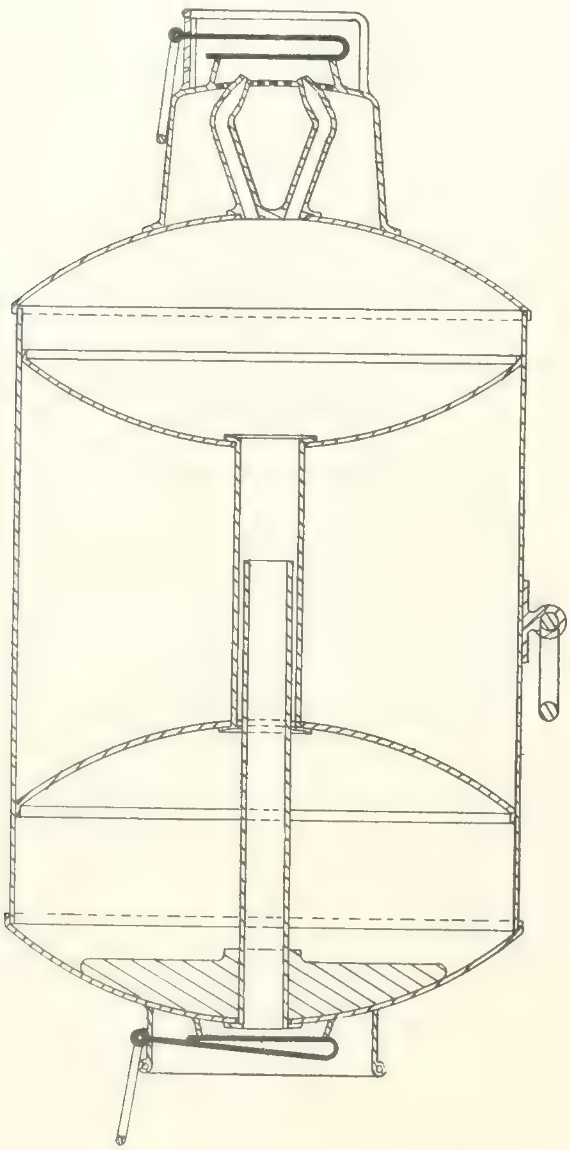
Messrs Small & Parkes, Ltd., of Hendham Vale Works, Harpurhey, Manchester, inform as that they have been awarded a gold medal at the Franco-British Exhibition for their "Karmal" packing and "Roko" belting.

Messrs. Wm. Simons & Co., Limited, engineers, ship and dredge builders, Renfrew, have been awarded the Grand Prize by the International Jury of the Franco-British Exhibition for their exhibit of dredge plant and elevating deck ferry steamers.

Turbo-Electric Propulsion.—This subject is to come before us again on Nov. 2nd, when the discussion on the paper recently read before the Institute of Marine Engineers by Mr. William P. Durtnall, M.I.M.E., is to take place at the London Institution, Finsbury Circus, London, E.C. Since reading the paper there has been ample time for reflection, and if the statements that Mr. Durtnall has made in reference to the possible saving in fuel is within the scope of practice, then the author deserves every encouragement, and it becomes a thing of great commercial value. It is, however, interesting to hear that large firms of repute are in a position to quote for 12,000 kilo-watt machinery arranged on the lines that Mr. Durtnall has pointed out, and we understand that the steam consumption can be guaranteed not to exceed 11 lbs. per kilo-watt hour; this represents with slow speed electric motors (say, about 200 Rpm. and 93 per cent. efficiency) a shaft horse-power for the exceedingly low consumption of 8·8 lbs. of steam per shaft horse-power hour, including auxiliaries. It certainly appears that Mr. Durtnall has pointed out a means of better utilization of coal and material which he so clearly points out in his paper. The provision of an electrical gear between the turbine and the propeller is also to be desired, as pointed out by Mr. Jas. Denny in his presidential address, in order to get that most interesting result of a light and efficient prime-mover, and a slow speed and also efficient propeller, making for more vessel speed, for a given coal consumption, consequently less cost per ton of displacement per mile, a step in the right drectiion. We shall await the result of the discussion with somewhat more than passing interest, and we shall refer to it in our next issue. We understand that some of our very largest ship owners are thinking this matter over, and that Mr. Durtnall has some schemes in hand for some fairly large ships. The German Government is at present engaged in fitting up a vessel on similar lines as Mr. Durtnall points out, which certainly goes to show that there is more in this scheme than appears on the surface.

THE "NEPTUNE" LIFE-BUOY LIGHT.

THE latest development in the construction of life-buoy lights of the class known as the "Holmes" light is being put on the market under the title of the "Neptune," by Messrs. Nunn, Ridsdale & Co., of 54, Minories, London, E.C.



We illustrate this device in the adjoining diagram. It has been designed to overcome disadvantages arising from the risk of the seals closing the carbide and phosphide chambers being accidentally damaged or broken, and the efficiency of these materials destroyed, and the tendency of the entire apparatus to get submerged, owing to its not maintaining its equilibrium.

By reference to the drawing it will be noticed that the device consists of an egg-ended cylindrical casing of thin sheet metal, divided by dished partitions into three compartments, the two outer ones being connected by a central tube, the middle chambers being hermetically sealed to form the buoyant element. The lower chamber contains carbide of calcium, and has a tube supported in its bottom which extends upward about half-way through the tube of the middle chamber, and by this tube the water is led to the carbide chamber from outside when the seal is broken, this latter consisting of a thin sheet of metal soldered over the orifice.

Around the seal is placed a shield or gallery of wire, so as to effectively protect it, for which purpose it projects beyond the outer end of the seal. The upper compartment is used for storing the acetylene gas when generated, and above it is arranged the chamber for the calcium phosphide, which is sealed in a similar manner to the lower chamber. The upper part of the chamber is fitted with a gauze cover for preventing a too free exhaustion of the phosphide flame when water is admitted.

The burner is of a duplex pattern, and is arranged so that the gas escaping therefrom comes into direct contact with the flame. This chamber is also provided with a protecting shield for the seal. A shackle is provided to which the lifebuoy is attached, while the two seals are fitted with suspension rings for the entire device, so that when it is pulled down from its support and thrown into the sea the seals will be broken, and on it reaching the water the lighting of the gas will be effected.

It is interesting to note that samples of this light have been submitted to the marine department of the Board of Trade, and the Board have decided to instruct their surveyors to pass these lights subject to the usual conditions as to check tests being made from time to time on board ship.

Dr. Schlick's Gyroscopic Apparatus for preventing ships from rolling at sea has just given fresh proof of its power and suitability for the work for which it is designed. The first apparatus made in England has been constructed at the Neptune Works of Messrs. Swan, Hunter and Wigham Richardson, Ltd., Newcastle, and has been fitted in the R.M.S. *Lochiel*, owned by the enterprising firm of Messrs. David MacBrayne, Ltd., of Glasgow. Lately the apparatus has been very thoroughly tried on the *Lochiel's* ordinary route between Oban, Tiree and Bunessan, with most satisfactory results. The apparatus can be thrown in and out of action at will, and, when out of action, the vessel rolled to angles of 16 degrees on each side, that is, the total angle of roll was no less than 32 degrees, whilst when the apparatus was put into action the rolling was prevented and decreased to a total angle of roll of from 2 to 4 degrees, an amount which is barely perceptible to a passenger. The apparatus has previously been tried in England by Messrs. Swan, Hunter & Wigham Richardson, Ltd., on an experimental vessel 116 ft. long, and these later trials on the *Lochiel* amply confirm the high expectations which have been raised. The gyroscope on the *Lochiel* is driven electrically, requiring little attention, whilst the design has been simplified and the machine is now very compact, and requires but little space in the steamer. Messrs. MacBrayne are well known for their magnificent passenger steamers which run on the Clyde, and amongst the Western Highlands and Islands of Scotland. They study the comfort of their passengers in every possible away, and nothing which they have yet done will be more appreciated, especially in stormy seas, than the application of this apparatus. As soon as the advantages of this apparatus are known to the travelling public, it will be a necessity on all boats carrying passengers, especially for short voyages, as by its means sea-sickness is greatly reduced, and "sea legs" almost becomes a meaningless phrase.

INTERNATIONAL CONGRESS AT PARIS.

THE weather in Paris during the sitting of the Congress of the Refrigerating Industries was sympathetic with the subject; the heat being such that a cooling of the atmosphere was a desideratum, and the visits paid to the various places of interest were carried out under excellent conditions for those provided with the lighter garments of summer. The officially arranged visits commenced on the afternoon of October 7th, when the insulated wagons used by the Société des Glacières de Paris were inspected by one section and L'Institut Pasteur by another section. The latter place partakes a good deal of the appearance of the Zoological Gardens, containing as it does a large number of animals of sorts from white mice to goats, on which experiments are made in the interests of science, with a view to the protection of man and his recovery from the maladies which have baffled the skill of the doctor and surgeon in their ordinary practice. The laboratories and wards inside the buildings, which are divided by a roadway, are well equipped and furnished for dealing in the special work with which the name of Pasteur is associated. In the evening a reception was given by the Vice-Rector of the University of Paris to the representative members of the Conference.

On Thursday, the visits were to the Electricity Supply Station at St. Denis, where 100,000 H.P. are dealt with; the Refrigerating Station of L'Abattoir de la Villette; and to the Conservatoire National des Arts et Métiers, which contains a very interesting collection of models and specimens of work of all kinds, valuable for the visitor to inspect, whether technically trained or not. The lady members of the Congress occupied the day from 9 a.m. till 5 p.m. on the river Seine and its banks, leaving Pont Sully in the morning by a river steamer chartered for the occasion; a call was made to inspect Notre-Dame, La Sainte Chapelle, La Conciergerie and adjacent buildings, the notable details being pointed out by Prof. Christian Schefer, the names of those who helped to make or mar the history of France being touched upon as the associations occurred in connection with palace or prison. Re-embarking, the party steamed past the Louvre, with its wonderful collection of antiquities, paintings, sculpture and works of art and science; the Place de la Concorde and the Tuilleries, with their memorable and historical associations; the Eiffel Tower; the remains of the last exhibition buildings; these and other buildings on both sides of the river, together with the bridges, all excited the admiring gaze of the party. Previous to arrival at St. Cloud, lunch was served on board, after which, the landing-place being reached, the ladies were escorted to the gardens, avenues and the surroundings of former grandeur, where stood the Imperial Palace—arousing mental pictures of what had been and might have still remained but for the unhappy circumstances which brought about the event of 1871. From sentiment and philosophy the thoughts and steps of the party were directed to the famous porcelain works at Sèvres—a visit which filled the ladies with pleasure and evoked acclamations of delight at the excellent and tasteful specimens of the potter's art which they were privileged to see. The return to Paris was made by steamer and the landing was made at one or other of the piers, most convenient to the hotels where the visitors were in residence.

On Friday afternoon the visits were to L'Usine de la Société de l' Air liquide; to l'Usine de la Société des Glacières de Paris; the day was brought to a close by a reception accorded by the *Figaro* proprietors to the members of the Congress.

On Saturday, the visit was along the course of the Seine by the Metropolitan Railway. In the evening there was held in the Grand Hotel, the official banquet of the Congress, presided over by the Minister of Agriculture.

On Sunday, a visit was arranged for those who were so minded to the Château and Forest of Fontainebleau. The Congress was brought to a close on October 12th, but several delightful excursions were arranged for the following days to several districts of France.

Section I. Amphitheatre Turgot.

In the first section the papers dealt with the effects of temperature generally. The meetings were held in the Amphitheatre Turgot and opened at 9 a.m. on Tuesday, October 6th. The first paper by M. Groth, in whose absence it was taken as read, dealt with the liquefaction of gases, including air, and gave a brief historical account of the discoveries made from the time of Faraday and Davy to those made by Sir Jas. Dewar. M. Georges Claude read a paper in which he referred to the work accomplished by Prof. Linde, in dealing with the compression of gases for refrigeration, and then described and explained how the constituents of the atmosphere may be extracted and made use of. A short discussion ensued. M. R. Pictet criticised some of the theories advanced in the paper and M. K. Onnes referred to some laboratory tests from 0° to 253°, and to the experimental tests on helium. On October 7th the meeting was opened by Major E. Doulet (Italy), who remarked on experiments with liquid air and described an apparatus for the purpose of separating the constituents of the atmosphere. M. Claude followed with some extended observations on the subject, referring specially to helium. M. Touplin commented on the method adopted by M. Bordas for analysing the constituents of the atmosphere. M. Mathias gave some extended remarks on the data obtained in connection with liquids and their critical temperatures obtained by M. Kamerlingh-Onnes (Holland); the results of investigations at low temperatures were then referred to and the variations in the co-efficients commented upon, with a further reference to helium.

On Thursday, M. I. Bequerel read a paper on his experiments and investigations on bacteria when submitted to the action of low temperature, and some discussion and resolutions were submitted in connection with the investigations and the desirability of extending their scope for the benefit of all concerned.

On Friday, Dr. J. M. Calaza gave some details of the arrangements made by his—the Argentine—Government for the protection of the public against the exportation of unsound meat. He pointed out the careful and systematic way in which the inspection of animals while alive was carried out and followed up to the slaughter houses and cold stores to the time of shipment. Professor Blitz referred to the nutritive value of frozen food; and a paper by Mr. W. D. Richardson on investigations on the storage of beef and poultry was then submitted, in which it was shown that there is no deterioration in frozen meat, but care is necessary in the freezing and the thawing. Mrs. Pennington gave a paper on some laboratory experiments on fresh and frozen meat and chickens, illustrated by lantern views. Mr. L. Jacob then read a paper by Dr. Bordas, Dr. Sabareaun and himself on the effects of low temperature on the secretions of glands and on the glands themselves.

Other papers communicated to this section were on the attaining of very low temperatures in the laboratory by Sir Wm. Ramsay and H. K. Onnes, the general use of cold air and cooling the atmosphere, the effect of keeping refrigerated produce for a length of time under certain adverse conditions, etc.

Section II. Amphitheatre Descartes.

These Meetings were held in the Amphitheatre Descartes. On the opening day, a paper was read by Mr. W. D. A. Bost, on the different methods used to obtain insulation tests and the need for a standard instrument for the purpose, the details of which he described. After some discussion on the subject, during which the difficulty of fixing the basis of testing and the value of laboratory tests were dwelt upon, M. Desvignes (Paris) gave a very complete paper on the conductivity of insulating material, which, he urged, was of great importance to know, in order to gauge more accurately the necessary plant required for storage spaces; a table showing the co-efficients of conductivity of different materials, compiled by various authorities, was submitted, and also a series of tests conducted by the author, so that a comparison could be made. He referred to the methods in general use for obtaining the values of conductivity of materials, and explained the method he had adopted. A discussion ensued, at the conclusion of which, M. Kitzinger (Germany) read a paper on the relation existing between the co-efficient of conductivity and the density, and the practical importance of an intimate knowledge of these elements to all those who are entrusted with the work of erecting storage plants.

Mr. J. H. Stone (New York), in a paper read in his absence, described the American theory of insulation, the materials

for which must be excellent non-conductors, have no affinity for moisture and as nearly as possible non-inflammable. The construction should be built solid, dependence being placed for the "still air"—the best of insulators—on the interstices of the material, rather than on the enclosed spaces between the layers as in the other systems. He pointed out that there is great lack of knowledge on the subject of the efficiency of insulating material. The next paper presented was by M. L. Denniel, who advocated prepared cork for insulation, on account of its low co-efficient of conductivity. He also gave an idea of the heat transmitted through a brick wall coated with cork, and also with an air space, which he considered should be thin with the air dry and still. A paper by M. Vogt was read by the secretary in the author's absence, referring to different kinds of insulators and claiming prepared cork to be superior. After some discussion, it was resolved that a table of constants and conditions should be made universal and agreed upon, so that the value could be recognised by all when temperatures and insulators were referred to in the results. A paper by M. V. A. Noodt followed, in which the growing scarcity of wood was referred to, and how material could be protected from destructive parasites to arrest decay. The various methods and chemicals used for the purpose were enumerated: 1. By the wood imbibing the preservative; 2. By impregnating under pressure; 3. By substituting an antiseptic liquid to the sap ducts. The chemicals hitherto used were $Hg. Cl_2$.; $Zn. Cl_2$.; $Cu. SO_4$.; Tar oil with creosote; antiseptic solution into which the tree is dipped at once when felled. It was pointed out that these processes are all unsatisfactory and that hylinit, one of the compounds of fluorine, is a material which, impregnated in wood, serves as an odourless, non-poisonous and disinfectant preservative. Attention was called by M. Freitag to the work being done by Prof. Henry to conserve forests. M. Ch. Tellier submitted notes on the diagrammatic curves in the compression of gases, and on the effects of temperature on explosives and danger of spontaneous combustion. M. Freitag then presented a paper on the coatings most serviceable for insulation; varnish or paint mixed with thick or resinous oils should be avoided and only the best paint and mixing material should be used. The loss of heat due to an unsuitable paint had been found by experiment to amount to 30 per cent.

M. Barrier remarked at the opening of the meeting on October 7th on the difficulty of fixing exact data, which would be applicable to all machines, and the desirability of having such. M. M. Leblanc (Paris) then read a paper on the standardizing of refrigerating measures and proposed that a choice should be made of convenient units for the measurement of the different quantities used in refrigeration, of a definition for the capacity of machines, of the efficiency of the machine and the adoption of a uniform method for testing refrigerating machines. He proposed that the metric system of measurement should be taken for ease and facility. He then gave symbols and definitions and entered very fully into the details of a scheme he proposed for adoption to the Congress. Considerable discussion ensued, and was taken part in by many members, and it was proposed that the subject should receive special attention from an International Committee. On October 8th, M. Hirsch (Düsseldorf) gave a paper on the desirability of adopting universal measures of caloric—as the centimetre, the gram, the second, the frigore, the kilogram—for international use of building materials, test methods and comparative researches. After some discussion, a resolution on the subject was proposed and adopted with a view to an international system being framed. M. Mathot then submitted a paper on the driving power applied to refrigerators, reviewing the different methods in use and advocating that a spare motor should be installed, on which a brief discussion ensued.

A paper on the unification of methods for the calculation of machinery, by M. Jacobus, was read by another member, in his absence, after which it was agreed that the proposal was already covered by resolution. M. Claude then gave a paper on air-refrigerating machines and gave some results attained by this system. After a few remarks on this subject, M. Andiffren (Grasse) gave an interesting paper on compression machinery, dealing with the different gases used for the purpose and their advantages. He then described the revolving machine, which, for many purposes has great advantages; a discussion ensued and the maker of the machine referred to was complimented on its success. On the following day, M. G. Doderlein (Germany) gave a paper treating on the history of compression machinery, with data gained by experience, showing the efficiency of the dry process of refrigeration, with formulæ and description of the machinery. M. Rau referred to the work done by the SO_2 machine, and M. K. Onnes to the thermodynamics of freezing, and M. Léanté followed referring to the great work done by Carnot on this subject. This was received with deserved applause. After some remarks by M. Bost, M. G. T. Voorhees (America) gave a paper on the different machines in use for the production of cold by compression and absorption, and gave a table of comparison, showing the steam used by different types. M. Mallehoncke then referred to a machine, which he described, and M. Goldsmith followed with further reference to another machine. M. Kögler (Germany) read a paper on the application of refrigerators to abattoirs, giving a description in detail of the plant necessary, with references to the working expenses. M. Spalek read the next paper, on the best system to use for refrigeration with ample command of water, and where water is scarce. After some discussion on this subject, M. G. Bullo (Milan) gave a paper on the brine system of refrigeration, pointing out the defects and how they may be overcome. M. Hoopman (Holland) proposed a series of questions on the best refrigerating system, and the necessity of investigating the details, with a view to the adoption of the best. After some discussion on this, M. Scaramussa made a few remarks on temperatures and presented a small model. M. Dickinson's (Washington, U.S.A.) paper on specific heat of calcium chloride was read by the Secretary.

Section III. Amphitheatre Richelieu.

The third section met in the Amphitheatre Richelieu on October 6th, and was opened by a discussion on a report from M. D. A. de Jong, on the installation of cold air for abattoirs, after which the order in which the papers should be taken was arranged in the several sub-sections. A paper was submitted by M. Pierre Bergês (Buenos Ayres) on the sanitary inspection of cold stores in Argentina, in which it was stated that previous to 1900, the meat exports by the Republic consisted mainly of live stock; since then the exportation of frozen meat had increased until it reached over half-a-million oxen. The measures taken for strict sanitary inspection were dealt with in detail, showing the care exercised to guard against any elements detrimental to the health of the animals before being killed or to the health of the public, at any of the stages through which the meat passes from the abattoirs to the consumer. A communication from M. De Saborsky was then read on the carriage of produce on the continent, when a resolution was submitted with the object of securing joint action to develop and extend the facilities for the transit of produce

M. J. de Loverdo (General Secretary of the Congress) then submitted a paper in which he pointed out from statistics that the consumption of meat per head of population in France was 38 kilogrammes per year, being 2 kilogrammes less than that of America (U.S.), 8·5 kilogrammes less than Germany and 13 kilogrammes less than England. He advocated a more general use of the carriage of frozen meat in preference to that of live stock, by which latter means, meat was brought to the consumer at a greatly enhanced cost, and deterioration of the stock. The establishment of abattoirs in various districts under careful supervision and facilities organized for the transit of frozen meat would be an immense gain to the general public, in improved meat and at less cost. Such an arrangement would also admit of better disposal of the subproducts, skins, hoofs, etc. He concluded by expressing the wish that the establishment of co-operative abattoirs might be organized; that the military and naval authorities should encourage such being established and that the use of refrigeration should become more general. Considerable discussion ensued, especially on the scope of co-operation in respect to the proposals conveyed in the paper. M. Jean Claude presented his book on "Air-liquide, oxygêne, azote" and received the thanks of the section.

On October 7th, the meeting was opened by resolutions based on M. de Loverdo's paper, which were passed, urging that abattoirs, on account of their nature and importance, should be subjected to strict sanitary inspection, and that on account of the disadvantages connected with the transport of live stock from a distance, the transport of refrigerated

meat should be encouraged as much as possible. M. Chapins then introduced an extended discussion on the merits of fresh meat, killed and used on the spot, and refrigerated meat, and especially in feeding large bodies of men in the field, how preferable was the latter, for several obvious reasons. A resolution was passed based on these conclusions. M. Lescarde gave some remarks on the advancement which had been made in the preservation of meat, followed by MM. Rappin and Charreaud at some length on the same subject in detail, pointing out where deterioration is likely to take place due to lax care and supervision. Resolutions were then submitted, urging that every care and attention should be exercised in the preservation of meat for food, by analysis and other means, to safeguard the consumer, especially in those countries which are large suppliers of food, whether preserved by freezing or otherwise.

M. E. Bazzi (Italy) gave a very complete and lengthy paper dealing with dairy produce. He urged the cooling of milk as soon as drawn from the cow, and described the most modern appliances used in dairies for this purpose, and advocated the brine system in preference to direct expansion, on the ground of improvement and economy. Referring to the production of butter and cheese, he pointed out that ice in churning had been used in Lombardy for many years and this butter had an excellent name for quality. For short storage of butter he advocated a temperature of 0° to +2°C., and for long storage—6°C. For storage of cheese (Gorgonzola and soft kind) +2° to +3°C., and +10° for firm cheese.

On October 8th, after discussion on the general work of the section and its bearing on special questions affecting it:

The following resolutions were then submitted and adopted: "That in view of the large expansion of the trade in refrigerated meat and the wide diffusion and distribution of refrigerated products, it is desirable that an international uniform standard of meat inspection be established and agreed to by the various countries exporting and importing animal foods, so as to ensure the healthy condition of the meat." This resolution stood in the name of Mr. G. Anderson and was submitted by Mr. J. H. Geddes, along with the following: "That the refrigerating industry, having attained world-wide importance, it is highly desirable that exact scientific data be obtained for determining the conditions as to time and temperature under which perishable produce can be satisfactorily kept."

(*To be Continued.*)

ASSOCIATION OF ENGINEERS-IN-CHARGE.

THE presidential address of this association was delivered by J. Swinburne, Esq., M.Inst.C.E., F.R.S., on October 14th, the subject being "Smoke." He began by humorously alluding to the number of houses in London exhibiting "To be let or sold" boards, and assigned the cause of this to the growing desire of people to live out of London, a desire which is rendered more practicable by the possession of a motor car. The reason for such a desire, he said, is that the country is more healthy. The air of London not only contains smoke, but carbon monoxide, sulphuric acid and hydro-carbons, substances which cause deterioration in material ways and, what is far more important, are most prejudicial to health. The subject of the prevention of smoke divides itself under two heads, prevention of factory smoke and that of house smoke. Factories: There are two kinds of smoke to deal with—tar smoke, caused by distilling volatile constituents of coal, and not burning them properly, and lamp-black smoke, *i.e.*, carbon in combination with hydrogen, caused by burning the volatile portions in flames, and letting the flames come against something which chokes them and separates lamp-black. In a newly-stoked fire volumes of tar smoke are given off from the coal, and the question is how this is to be burned. The only thing to do seems to be to raise the gas containing the tar to a high enough temperature to ensure complete combustion, and it is not easy to see how to do this. No heat should be taken from the fire or from the gases until all the smoke is completely burnt. As to the methods of stoking, mechanical stoking has the advantage over hand stoking in that it can go on continuously without interfering with the draught, for although all the air necessary for the complete combustion does not come up through the fuel, the mistake is generally made in admitting the air in a large stream and not allowing time for it to be mixed thoroughly with the gases coming off the fire. There are a great many automatic stokers, all intended to prevent smoke, and many of them the result of great ability and experience. But the makers never really have a fair chance. The boiler maker seems to have a fixed idea that the fire ought to be inside the boiler, and the water ought to be as close to the fire as possible. It will be found that in almost all cases of smoke the fault is not want of air, but cooling the gases from the fuel before they have been properly mixed with the air. In other words, the fuel is too close to its work. Each piece of coal coming on to a hot fire, of course, gives off smoke at once, but whether that tar is burnt or not is a matter of temperature and time. It is therefore important to have some arrangement which will keep the gases at high temperature for a short time. House Fires: The smoke nuisance from small fires is more serious than that from industrial furnaces, and more difficult to legislate about, for a large chimney giving out smoke is obviously a malefactor, while a small house chimney seems to be merely adding a drop to the ocean, and thus escapes notice. The real question is not whether the big gives out more smoke than the small chimney, but whether it gives out more smoke per ton of coal used. In this respect there is no comparison, the small chimney is infinitely worse.

The important fire, from the smoke point of view, is a sort of small kitchen range which is used in small houses, cheap, and as extravagant in fuel and as smoky in burning as can be made. This is always going, summer and winter, and the fire has to serve as kitchen and sitting-room fire in winter and for cooking in summer.

The most obvious cure for domestic smoke from all kinds of fire is coalite; this is bituminous coal which has been distilled at a low temperature. This drives off about two-thirds of the volatile matter. What remains comes off when the coalite is burnt and burns with a thin yellow flame with no smoke.

Another solution is to use gas. If the gas companies were released from their obligations as to illuminating power, they might supply cheaper gas, which would be used for heating and cooking; and for lighting people would use mantles. At present the chief difficulty is the backwardness in the construction, or rather the design, of gas stoves. Heating by lamps is not satisfactory from the health point of view, and hot-water pipes heated by a properly designed furnace are out of the question for small houses. As to prevention of smoke, then, smokeless fuel and gas heating seem the only cures at present. Recording Smoke: It is important to keep some record of emitted smoke, since the London Act provides that the first fine for emitting black smoke may be £5, and the second £10 and so on in geometrical progression. Without records a magistrate has to decide whether there has been black smoke from the evidence of witnesses. A system of photographic records has been devised by the author which is better than the rough product with smoke scales on paper, although itself far from perfect. The proper solution is not to improve the methods of making records, but to stop making any smoke, so that there is nothing to record.

THROUGH pressure on our space, we are obliged to hold over several articles, including Electricity on Board Ship, and On Heat Losses.

MESSRS. S. T. TAYLOR & SONS have covered boilers, pipes, etc., of the s.s.'s *Hildago*, *Triton* and *Mina* with their "Tynos" non-conducting material. Covered cylinders of s.s. *Ottar* with their "Tynos" non-conducting material. Covered boilers, pipes, etc., of s.s.'s *Fangturm* and *Bedonia* with their "Tynos" non-conducting material, and boiler bottoms with their "Tynos" patent removable asbestos mattresses, and very extensive covering work on H.M.S. *Invincible* at Elswick shipyard. Also boilers, etc., of s.s.'s *Conqueror*, *Paris* and *Oneida*.

Industrial and Trade Notes.

THE CLYDE AND SCOTLAND.

(*From our Own Correspondent.*)

First Lord of the Admiralty on the Clyde. — The First Lord of the Admiralty (Mr. Reginald McKenna, M.P.) paid a visit to Glasgow on October 16th, the main object of which was to deliver an address on "The British Navy," under the auspices of the Glasgow Parliamentary Debating Society, and during the day he had the opportunity of seeing places and things closely related to the subject of his address. The Clyde Trustees placed their steam yacht *Comet* at his disposal and a select party of city magnates and Clyde captains of industry accompanied him. In the afternoon Mr. McKenna was enthusiastically received on the Royal Exchange, and gave a short address, in which he remarked that the Clyde shipbuilding yards might look forward to receiving at the hands of the Admiralty no less fair treatment in the future than they had done in the past. In the course of his eloquent address in the evening, which was listened to by an overflowing audience, he spoke of the large and important contributions the Clyde yards had made to the Fleet, and said Glasgow might be regarded as the best equipped port in the world for the building of modern warships. He gave an account of the remarkable developments which had taken place in recent years in naval construction, and enunciated the leading principles of British naval policy, which were to ensure that we could meet successfully any foe or combination of foes. Not the least interesting statement in his admirable address was one to the effect that one of the new fast protective cruisers, of which three have to be given out, would be named *Glasgow*. The name has not appeared on the Admiralty list for a quarter of a century. Not only will the appellation be given to one of the new vessels, but he hoped further that the *Glasgow* would be constructed on the Clyde.

New Naval Work.—At the time of writing it seems to be reasonably sure that at least six of the fourteen new destroyers have been ordered from Clyde firms, three being given to the Fairfield Co. and three to Messrs. John Brown and Co., Clydebank. Mr. Asquith made it fairly clear to the House on the 21st inst. that "tenders had been accepted for nine destroyers at a cost of £900,000 at least six weeks earlier than was intended." Then other three of the nine spoken of have gone to Messrs. Cammell, Laird & Co., Birkenhead. The remaining five (or seven) boats are still to place, as many as ten firms being interested in the distribution of the work. Satisfactory so far as it goes, this order is regarded as only a minor instalment of the fresh work which the Admiralty are pledged to give orders for at this time. Several of the larger firms, whose stocks of working plant sadly need requisitioning, are looking forward to getting a share of the orders for the cruisers of the *Boadicea* class, although these vessels are somewhat of the smaller order. Intended for scouting purposes they are to be sister ships to, although somewhat bigger than, the *Boadicea*, which was built at Pembroke, and engined by Messrs. John Brown and Co., Ltd., Clydebank. They are 3300 tons displacement and are to have turbine engines of 22,000 h.p. to give the vessels a speed of 25 knots, about the same as the bigger *Indomitable* class. They will have five screws, and steam will be generated in water-tube boilers of the Yarrow type. These ships are valued at about £330,000 each, and the placing of one or two on the Clyde is being looked forward to by employers and workmen with great interest.

New Naval Ships Commissioned. — The new armoured cruiser built and engined by Messrs. John Brown & Co., Clydebank, was commissioned at Chatham Dockyard on October 20th. She strengthens the Nore Division of the Home Fleet, to which all the latest types of warships are being added on their completion for sea. The *Inflexible* is the third ship of the improved "Dreadnought" class, another member of the group from Clyde stocks being Fairfield's *Indomitable*, which so distinguished herself for speed on the Atlantic this summer. A fourth vessel of the group will shortly be added by the delivery, from the works of Sir W. G. Armstrong, Whitworth & Co., Newcastle-on-Tyne, of the *Invincible*, which vessel begins her steam and gunnery trials on November 3rd. In this case the turbine machinery was made by Messrs. Humphreys, Tennant & Co., of the Thames. The last of the four torpedo boats which were ordered by the Admiralty from Messrs. William Denny & Bros., Dumbarton, last year was launched in the latter end of September. These vessels are of 250-tons displacement and are fitted with turbines of the Parsons type by Messrs. Denny & Co., the associated engineering firm. The vessels have been specially arranged to burn oil fuel in their boilers. Their designed speed is 30 knots and two of the four have been for some little time past in the Navy, having in every respect fulfilled the conditions as to speed, fuel consumption and their ability to maintain a given speed for long stretches at sea. Experience with these vessels, and vessels of the same class by other firms, is believed to have confirmed the Admiralty in a preference in such craft for sea-going qualities rather than high trial-trip speeds.

Launching Activity.—Saturday, October 10th, was another "field" day in the matter of consigning new tonnage to the water, as many as six vessels, aggregating about 16,500 tons, having been sent off the stocks in Scottish yards. Two of the vessels were launched from Clyde stocks, the remainder being from yards on the East coast of Scotland. By far the largest vessel was the twin-screw steamship *Malwa*, launched by Messrs. Caird & Co., Greenock, for the Peninsular and Oriental fleet. She is of 11,500 tons register, 560 ft. long by 61 ft. beam and the largest vessel ever constructed at Greenock. Her sister ship the *Mantua* is still on the stocks, and will be launched in the course of a month or two. These two vessels, along with the *Morea*, a similar vessel launched by Messrs. Barclay, Curle & Co. in August, are intended for the P. & O. Co.'s trunk service to India and Australia, and are the largest vessels in the company's fleet, which now consists of an aggregate tonnage of 415,000 tons. Each vessel will have excellent accommodation for 400 first-class and 200 second-class passengers. For ensuring the silent working of cargo the vessels are fitted with hydraulic gear and have refrigerating machinery and insulated cargo holds for the Australian trade. The vessels are to be fitted with quadruple-expansion engines to give a high rate of speed. Other vessels launched on the same date were the *Alethea*, a screw coasting steamer of 600 tons deadweight capacity, by the Ailsa Shipping Co. to the order of the Zillah Shipping and Carrying Co., Liverpool; the *Cabo la Plata*, of 3000 tons deadweight, by the Greenock and Grangemouth Dockyard Co., to the order of Messrs. Ybarra & Co., of Seville, for their fruit and wine trade; a steam trawler of 125 ft. length by Messrs. A. Hall & Co., Aberdeen; a steam trawler of 137 ft. length by the John Duthie Torry Shipbuilding Co., Aberdeen, and the *Eumeralla* of 200 ft. length by Messrs. Scott Kinghorn, Ltd., to the order of Messrs. Howard, Smith & Co., Ltd., Melbourne. The Kinghorn firm having exceptional facilities for installing machinery on board vessels while on the stocks, the *Eumeralla* immediately after her launch proceeded under her own steam to Burntisland to load cargo.

Screw Steamers for Shallow Rivers.—Early in October there was tried for speed on the Clyde a steam pilot launch of light draught, a feature of which, although comparatively novel on the Clyde, has been introduced and adopted largely by other firms throughout the kingdom, notably Messrs. Yarrow & Co. at Poplar (now of Scotstoun-on-the-Clyde). This is the tunnel principle of construction at the stern, whereby, with the propeller working in solid water within the tunnel, propulsive efficiency is secured for vessels of the very lightest draught and by which it is possible to use screw-propelled vessels, where under ordinary circumstances only side or stern-wheel steamers would be satisfactory. The hull of the launch in question was built by the Ardrossan Shipbuilding Co., Ltd., Ardrossan, the machinery being supplied by the firm of Messrs. McKie & Baxter, Copeland Engine Works, Govan. The hull is built of galvanized steel and combines requisite strength with the minimum of weight, and consequently of draught of water. The engine is of the ordinary compound reciprocating type, steam being supplied by a return-tube boiler worked under forced draught. The pumping arrangements are separate from and independent of the main engine. The mean draught on the launch on trial was 21 in., and throughout the trials the engine was kept running continuously at 370 revolutions, the speed attained being fully two miles per hour above the speed

stipulated for. The little vessel is named the *Chin*, and has been constructed for the Irrawaddy Flotilla Co., Ltd., Burmah, by whom she will be employed on the Chindwin river, a tributary of the Irrawaddy, cumbered in the dry season by many shoals dangerous to navigation—for laying mark buoys. She was shipped on board the steamer *Ava* of P. Henderson and Co.'s fleet, which sailed from the Clyde on September 25th for Rangoon. While she is probably the first launch of this type that has been built and tried on the Clyde, the tunnel principle, as has been said, has been embodied in many light draught vessels built elsewhere. Generally speaking, steamers for shallow river navigation until within recent years were propelled by stern wheels, many of these, for example, having been built by Yarrow & Co. and others for Lord Wolseley's expedition up the Nile in 1887, and also for service on South American rivers. Stern wheel steamers of light draught are still being built in considerable numbers. Latterly, however, in the experience of Messrs. Yarrow especially, this system has been superseded by the method of propulsion involving a raised propeller working in a tunnel under the stern of the boat, the after end of tunnel being closed by the Yarrow patent hinged flap. By these means the best results are obtained as regards speed and carrying capacity at all draughts. The adoption of the Yarrow fitting, which is a very simple one, ensures extra speed without expenditure of any extra fuel. For several years past Messrs. Yarrow's yard at Poplar has scarcely ever been without several such craft under construction, and now that the Yarrow firm are fully established in their new works on the Clyde, vessels in which the tunnel principle is a feature will not be so much a Clyde novelty. The work presently on hand in the Yarrow establishment includes four or five vessels all propelled by twin screws working in stern tunnels. One of the vessels is a shallow draught gunboat 120 ft. in length for the Portuguese Government. Two are shallow draught steamers, one for service on the river Magdalena in South America, and the other for navigating the upper reaches of one of the rivers in New Zealand. The work on hand includes also a set of twin-screw machinery for a shallow draught steamer of the stern tunnel type being built by Messrs. Rennie, London, for the Tigris and Euphrates Navigation Co.

Steam Power for Fishing Craft.—The devising of a suitable type of machinery for auxiliary power in fishing craft has occupied the serious attention of engineers for a considerable time, and many more or less successful results have followed. One of the latest attempts to supply what is needful and in every way suitable has been made by Messrs. John Scott and Co., engineers, Paisley. Hitherto the majority of the experiments and applications made have been with a view to using internal combustion engines for propulsion. Messrs. Scott, however, have adopted steam as the motive power, maintaining that a steam engine is less likely to get out of order at sea because the majority of fishermen who have been trained on steam trawlers and drifters already understand the working of this kind of machinery, and steam affords the means of actuating the heavy capstan on board a fishing craft for which purpose, in any case, a donkey boiler is usually carried. Messrs. Scott have installed their special steam propulsive machinery on board an ordinary fishing boat of 52 ft. keel from the East coast of Scotland, and with it successful trials have been carried out on the Clyde. In the engine designed and fitted by Messrs. Scott paraffin fuel is used and the generator is of the flash type. The consumption is from 2 to 2½ gallons per hour, with the engine developing over 40 horse-power at 275 revolutions and a working pressure of about 500 lb. The paraffin is fed under pressure from a tank having a capacity of 80 gallons. The burner has twenty-seven jets arranged in series so as to be easily under control. The generator is fed by a small reciprocating pump, and the feed water passes through an exhaust heater. The cylinders, which are three in number, are arranged horizontally above and across the crank shaft, and each cylinder has two pistons acting on the crank shaft through rocking levers. Lubrication is effected by a special rotary pump, which distributes the oil to all the bearings. The surface condenser and the oil cooler are fitted outside the hull. It is estimated that the working cost of the plant at sea will be from 1s. to 1s. 6d. per hour.

Ship Repairing.—Two important ship repair jobs are now under progress in Clyde shipbuilding establishments, the contracts for which were booked early in October at a time when the fresh work was warmly welcomed as affording employment for a small proportion of the vast numbers of idle hands through the acute dearth of orders for fresh tonnage. The large Cunard triple-screw turbine steamer *Carmania*, produced in 1905 by Messrs. John Brown & Co., Ltd., Clydebank, is now in the hands of her builders for a thorough overhaul. The *Carmania*, as is well known, was called into being—at all events as regards her turbine machinery for propulsion—largely, if not chiefly, as a step towards a realization of the larger conception of the four-screw turbine steamers *Lusitania* and *Mauretania*, and is a sister ship in all essential respects, save as to her turbine machinery, to the *Coronia*, built at Clydebank a short time previously. From the time of her advent on the Atlantic in 1905 and at least till the coming of her successors, the *Lusitania* and *Mauretania*, she was, on account of her steady turbine propulsion, a most popular vessel on the Liverpool and New York service, and has run with great success and regularity. From the work of overhaul now proceeding it is more than likely that useful facts will be gathered as to the period of efficiency and the wear and tear and lasting character generally of turbine machinery. The French steamer *La Marsa* is in the hands of the Clyde Shipbuilding and Engineering Co., Port Glasgow, undergoing a thorough overhaul and renovation, the estimated cost of which lies near to the substantial figure of £20,000.

Instruction in Shipbuilding at Leith.—Among the items on hand at present in the works of Messrs. Kelso & Co., mechanicians and ship model makers, 1008, Pollokshaws Road, Glasgow, is a large ship model intended for instructional purposes in Leith Nautical College. The model is not of the "block" order, but is "built" of brass bars and plates, and represents an up-to-date cargo steamer with raised quarter-deck, bridge and forecastle, the dimensions being, length, 260 ft., breadth 40 ft. and depth 20 ft. The model is made to a scale of half-inch per foot or one-twenty-fourth the actual size. It shows sectionally the vessel's interior and the frame work and plating of such features as the cellular double bottom, with floor plates, frames, reverse frames, hold side frames, bracket connections of side frames to tank margin plates, beams, stringers, etc. Water-tight bulkheads are also shown, with stiffeners to same, as also deck plating, and how the stern is constructed and connected to body of vessel. One side of the model is completely plated, the landing edges, butts and straps all appearing. At various parts, too, the riveting of butts and landing is shown with striking fidelity to those features in the actual ship. At midships for a certain length, the full section of the vessel is shown with shell plating left off on one side, giving a view of the entire transverse frame of the vessel. In short, this ingeniously devised production is intended as far as possible to show all details of ship construction and enable students, who have rarely the opportunity of visiting shipyards, to have an intelligent understanding of how modern vessels are constructed. Two classes of students will benefit from the instructional model, namely, the South Kensington Science and Art Naval Architecture Evening Classes, and the Day Class, held in the Nautical College for sea-faring men, who are desirous of obtaining an extra-master's certificate and who have to pass an examination on ship construction in order to obtain it. The teacher in both departments is Mr. James Stevenson, head designer in the shipyard of Messrs. Ramage & Ferguson, Leith.

New Graving Dock for Leith.—Leith Dock Commissioners, on the recommendations of the Works Committee have decided to proceed with the completion of the graving dock allowed for in the design and construction of the quay walls of the Imperial Dock, opened to traffic a few years ago. Leith for some time has been experiencing the disadvantage of being without a dry dock, capable of accommodating the large vessels from the Black Sea and Mediterranean, which now frequent the port. A report is being prepared as to the maximum dimensions which the site for the new dock will admit of, and it is understood that these will be such as provide for every likely expansion during coming years in the size of vessels seeking accommodation at the port.

Submarine Depot at Dundee.—A party of officers representative of the Admiralty have recently been to Dundee, making investigations as to the suitability of a part of Dundee docks for the repair of submarine vessels. At the present

time there is no such depot existing on the east coast, and it is believed that the Admiralty would propose utilising such facilities at Dundee prior to the completion of Rosyth Naval Base. As it is proposed to have a depot for twelve submarines, it is necessary that graving dock facilities should be available for docking two submarines at one time. Attention was specially paid to the west graving dock, which is situated at a very central part of Dundee harbour and is entered from King William Dock. It was ascertained that the graving dock should hold two submarines on the blocks concurrently. In the adjoining King William Dock there are facilities for giving suitable accommodation to a flotilla of submarines. On the conclusion of the inspection the Admiralty representatives, it is believed, expressed themselves as being highly satisfied with the facilities. King William Dock extends to $6\frac{1}{4}$ acres, and one theory is that if the Admiralty negotiate for it as well as the graving dock, a part of that dock might be piled and workshops built over it, the remainder being preserved for the protection of submarines. Apart altogether from these facilities, it has been pointed out that as the large ship-building yard of Messrs. Gourlay Brothers & Company had been standing empty for several months, it might be that the Admiralty would consider whether they could utilise the ground for building purposes in the event of their making Dundee the head-quarters of a repairing depot. A strong feeling prevails in Dundee that the negotiations will be successfully carried through, as the Harbour Trust is prepared to meet the Admiralty and render every assistance required.

Glasgow Technical College Scientific Society.—The opening meeting of the seventeenth session of this Society was held on October 17th, when the new president, Mr. A. G. Strathearn, M.I.Mech.E., gave his presidential address, in the course of which he dealt with the qualifications necessary for a successful engineering career. Mr. Strathearn, it may be stated, served his apprenticeship in general engineering works in Glasgow, afterwards gaining experience as a marine engineer till the year 1840. From that year till 1896, he was engaged in the management of engineering works, and subsequently undertook the manufacture of weldless steel chains on the Rongier process. In 1897, he invented a process, which superseded that of Rongier, and he has since been engaged in perfecting and producing weldless steel chains by his own process, which is covered by numerous patents, the work of manufacture, by the Weldless Steel Chain Co., Ltd., being carried on in very specially equipped works at Gartsherrie, near Glasgow. The chain produced is capable of withstanding a test load equal to double that required by the Admiralty, in addition to possessing other material advantages. The secretary of the Scientific Society reported that the present membership numbered 293, 121 being ordinary members, 112 standing members, 6 life members and 54 honorary members. From the number of important papers on the syllabus, it is anticipated that the coming session will be as successful as the preceding sessions have been.

THE TYNE.

(From our Own Correspondent.)

An Era of Peace.—Whatever else the future may have in store, it seems absolutely certain that there will be no more unnecessary stoppages of work in the shipbuilding and engineering trades through labour differences. It is understood that arrangements have now been made which are of a mutually satisfactory character, and under which every kind of dispute that may arise in these industries will be capable of settlement without interruption to work. In the present dull state of business this may not seem a matter to be very jubilant about, and an announcement that a number of new orders had been placed would doubtless arouse greater interest ; yet the assurance of an immunity from industrial strife in the future is a great thing, and ought to give new confidence to capitalists and new hope to the working and trading communities. The Employers' Federation has been chiefly instrumental in bringing about this arrangement for the amicable settlement of labour disputes, but a single-handed effort in the same direction has been made by Sir Christopher Furness, who has made definite proposals to the trade unions connected with shipbuilding which have for their object the permanent establishment of more harmonious relations between employers and employed. The proposals of Sir Christopher apply only to the works under his control, and are therefore of somewhat limited scope ; but they bring to public remembrance a most important aspect of the labour question, and may ultimately cause very drastic changes.

Admiralty Contracts.—It is now known that two or three Tyneside shipbuilding firms have been invited to tender for work about to be given out by the Admiralty to private builders, and great disappointment will be caused if a substantial share of the work is not placed in this district. Jarrow especially is in need of work, the berths of the Palmers' yard being practically without occupants. The company, however, have had unique experience in Government work, and have always given satisfaction, both in quality of work and in the almost equally important matter of prompt delivery. In these circumstances the chances of the company getting a share of the orders seem particularly good.

Work at Low Walker.—The whole of the yards at this centre appear to be again busy, the Armstrong-Whitworth establishment having received a further accession of work. Messrs. Wood, Skinner & Co., of the Bill Quay Yard, are also well employed, and at Messrs. Dobson's establishment considerable activity appears to exist. At Wallsend the number of empty berths is no less than it was a month ago, but it is reported that some new orders have been placed, and a change for the better may consequently be expected. The two large graving docks at Hebburn are occupied with vessels undergoing repairs, but most of the shipbuilding berths are still empty. The yards in the lower reaches of the river are very short of work, but repairing establishments are doing better and the available facilities are being pretty fully utilized. Rumours are current of several orders for new tonnage having been recently placed, and though nothing definite is known, it seems probable that tangible evidence of an increase in the volume of work will soon be witnessed at several establishments.

Engineering Work.—Though some three or four weeks have now elapsed since the ending of the engineers' strike, it is but too obvious that a good proportion of the men have not yet succeeded in getting back to their respective jobs. The truth is that there is not room for the whole of the men who were " out," and it is to be feared that the services of a considerable number will not be requisitioned for a long time to come. The works which are showing the nearest approach to animation are the North-Eastern Marine, the Wallsend Slipway and Parsons' works, at all which establishments night work is being resorted to. We are pleased to note that several departments at the works of Messrs. H. Watson & Sons, Walker Gate, are showing evidences of briskness. This is rather exceptional just now, and it may be inferred that notwithstanding the prevailing slackness, the high character of the firm's specialities still commands attention from shipowners who desire the best results in economical working. Messrs. Donkin & Co., of the St. Andrew's Works, are receiving a fair proportion of such orders as come on the market, and are able to keep the bulk of their hands employed. Iron foundries have not yet begun to show improvement, though a change for the better was expected to result from the settlement of the engineering dispute. It is hoped, however, that things will brighten up a little towards the close of the year. In the brass finishing and copper-smithing trades dulness still prevails, and the condition of matters in the forging industry is going from bad to worse. Steel works at Newburn and Jarrow are a little busier, and the weekly output of steel plates and bars at Consett is steadily becoming larger. Within the past few weeks some of the departments of the Elswick works have become distinctly busier, and it is believed that the improvement will soon become general throughout this great concern.

THE WEAR.

(From our Own Correspondent.)

Shipbuilding.—Since last month Messrs. Bartram & Sons have resumed work in their yard, after a few weeks' stoppage, and it is hoped that business will now go on uninterruptedly

during the winter. The Sunderland Shipbuilding Company have also work in hand, but at Messrs. Blumer's there is very little doing. Messrs. Crown's yard is also only in partial operation, but the firm's slipway is occupied by a vessel undergoing repair.

Messrs. J. L. Thompson & Sons' North Sands yard is now showing something like its normal appearance, nearly all the building berths being occupied. The frame-bending department is still kept busy, and the outlook for the winter is now much better than it was some weeks ago.

Messrs. S. P. Austin & Sons are still slack in the shipbuilding department, there being only one vessel on the stocks. The firm's repairing resources, however, are being kept fully utilized, the graving dock and pontoon being both occupied with ships receiving overhauls. There are also some vessels moored in the river, to which the firm are doing repairs, and on the whole it may be said that the various departments are satisfactorily employed.

Messrs. Short Brothers.—This firm are now much busier than they have been at any earlier period of the year, and large additions have been made lately to the number of hands employed both at new and old work. The steamship *Kelvin Bank*, which has hitherto been engaged in the ordinary cargo trade, is now moored beside the yard, and extensive alterations of a structural kind are being made with the view of fitting the vessel for service in the frozen meat carrying trade. It is expected that another large cargo boat will shortly arrive at the yard, to be similarly altered. It is announced that Messrs. Doxford have received an order for a vessel of an improved type which is to be specially equipped for the expeditious handling of cargo. This new experiment will be watched with interest, as very exceptional results are expected from it. The rumour is current that early next year a syndicate will be formed to take over the Deptford yard and its adjuncts, with a view to the resumption of business as soon as practicable. The yard is fully equipped with the very best machinery and in other respects possesses marked advantages—in these circumstances it is most improbable that it will be allowed to remain very long in a state of unreproductiveness.

Engineering.—There is no appreciable change to note in the state of business at the larger works; but some of the smaller establishments are beginning to show signs of improvement. There is no increase of work at the foundries, and in no case is there a full staff of hands employed. The local ironworks are only running half-time, and wire rope works are very slack.

It is announced that Messrs. Doxford have entered into arrangements with the Parsons Company, by which they will be licensed to manufacture turbine engines of the Parsons patent. These engines, it may be stated, are now ordered for the equipment of all vessels building for the Admiralty.

THAMES.

(*From our Own Correspondent.*)

Port of London Bill.—As the time draws near for the settlement of this question in Parliament the opposition is becoming more pronounced. Time has now been given for better digestion of the principles of the bill and what looked fairly rosy at the outset now, when picked to pieces, tells a somewhat different tale. It has been found in the meantime that the port is a cheap one, and the river deep, and that if the bill becomes law the dues on ships and goods will tend to crush out the trade of the port. It is seen there is at present no clear idea as to the dues to be imposed per ton. We know that public bodies cannot work cheaply and with the dock purchase to pay, port and wharves and jetties to be erected it is quite possible a rate will be inflicted on traders that will be prohibitive. We know the burden of the local authorities' demands in London, and it is only to be feared the same thing will occur on the river. It begins to be pointed out wherein the weakness of the London dock systems lies, and if these are correct the new authority would be paying in substantial form for what is of obsolete value. This, of course, is only of benefit to the dock shareholders and not at all to shipowners and traders. These opinions are those of men of the very best experience on the river. If industries are to remain costs must be kept down, but it is asserted, with what appears some tangible ground, that as at present outlined taxes must be put on goods running into seven figures, which must come as a heavy and deterrent charge on the port's trade. The real issue appears to be that the docks are one thing and the river another. The docks are dear but the river is cheap, and though it would be a wise provision to be enabled to cheapen the docks this should not be done at the expense of the river traffic. It seems obvious, therefore, that if the burden, if any, comes from the whole under the new scheme the short sea trade must suffer at once, and curiously too, the Dock Cos. themselves are not in favour of purchase. The scheme has been forced on them by the Government, or else they say they must submit to be ruined by any competition that might be set up. The Surrey Commercial Dock Co. is an exceptionally thriving concern, but it has to meet the same fate as the others and be wiped out of existence, showing the extent of the opposition. The Thames Conservancy have put forward resolutions against dock purchase in strong terms. The Waterside Manufacturers' Association is another body that has been heard complaining loudly. This body represents £100,000,000 of capital and say that they have not yet had a hearing. They have been muzzled which is obviously not as it should be. Again, the figure for dock purchase is now shown to be too high. The Government have been too generous with other people's money, it now appears, and they are making a bad bargain for the future trade of the port. The more then the question is examined (and it has been gone into lately very closely) it is seen that we are on the eve of giving over a machine which is working fairly well and doing good work for something that is likely to put us in a backward position and not do what is expected of it. Instead of improving the facilities, we have at the last moment thoughtful minds coming to the conclusion that the new authority will make matters assume a ruinous aspect by higher charges that the various trades concerned cannot bear. It is said, for example, the railways will gain and the ships suffer in the coal trade. Anyway, it is evident that riverside manufacturers and short sea traders will have to pay for any excessive price to be paid for the docks, and if these docks are obsolete and the price to be paid too high, better leave the question where it is than introduce another of the numerous public bodies all tending to strangle trade and in this case the one we are intimately concerned with is that of ships and shipping. We have seen Yarrow & Co. and Thornycrofts go, and other firms have not held their own. Where, then, is London to be if all manufacture is stifled? This is a real serious question. Any increase of costs should be so considered, and the future authority will be government by amateurs, it is to be feared, instead of what we have now, docks and river worked by experts each in their own branch.

Naval Work for the Thames.—The members of Parliament interested in the East End have not been slow in bringing before the Government the desirability of a part of any Naval programme of work being allotted to London, and there is some hope that this view will receive attention. The First Lord of the Admiralty is at least sympathetic.

New P. & O. Boat.—The P. & O. Co. have just had launched at Greenock the *Malwa*, a new vessel of the "M" class. These boats are the largest ever constructed at Greenock by Messrs. Caird & Co., and are each of 11,000 tons.

The Chairman of the Royal National Lifeboat Institution.—To fill the vacancy caused by the death of Sir E. Birkbeck, the late deputy-chairman, Col. Fitzroy Clayton, is called on. This gentleman has filled the position he vacates for twenty-five years, and to succeed him the Earl of Hardwicke is appointed to the vice-chair.

The late Mr. W. M. Bullivant.—This well-known gentleman, prominent in wire rope making, and as a founder of the Royal Naval Reserve and secretary of the training ship *Worcester*, has recently passed away at the age of eighty-one. Besides wire rope, the torpedo net for the protection of warships was this gentleman's idea.

NORTH-WEST OF ENGLAND.

(*From our Own Correspondent.*)

The Spanish Rumours.—Fresh rumours are being spread about as to the placing of the orders in connection with the reconstruction scheme of the Spanish Navy. The firm of Vickers are credited with the orders for the whole of the

battleships, while the smaller fry are going to Genoa. It is not the first time that Vickers' name has been mentioned in connection with the Spanish work, but every time that it has arisen it has been denied. When the Sheffield and Barrow firm were approached in respect to the last cable they did not deny it but "discredited" it. There is no doubt about it that at the present there can be nothing but rumours, for in Spain the final decision has not been arrived at, but it would not be surprising to hear that the forecast was true. Of course, Vickers' are acting jointly with Armstrong's of Elswick, so that whatever order is booked, these two firms will share, but the engines and boilers will be made at Barrow, as in the case of the Brazilians. It may be some time before there is any official statement, but it is awaited in this district with a fair amount of confidence. Between them, the firms could deal with everything required as regards the battleships, but in the smaller craft, Thorneycrofts' would take a share, as they are also in the Vickers combination. The question as to how much will be done in this country, taking for argument's sake that the orders were placed, as rumour would have it, is rather a moot point at present. Spain want them building in their own country, but the builders would want to do as much work at their own yards, for the results would assuredly be better. It is understood that Spain will insist on the work being done there, but no yard at present can boast of anything like up-to-date plant. Perhaps that country will in the long-run see the advisability of having the battleships constructed at the English yards and thus be able to receive the vessels completed. Such a course would be a sensible one and would be a saving also in many ways. Work at Barrow is not so plentiful and such an order would be a boon to the town. Already many of the heads from Vickers' have been over to Spain in connection with the tendering and the inspection of shipbuilding facilities, and this would seem to point to the probability of some of the work coming to Barrow. Towards the end of the year, we may hear something official, but in connection with the placing of the work there is the financial side of the matter, which, with a country like Spain, is a somewhat important one.

Other Prospects.—There is a slightly improved prospect in the shipbuilding trade and next year should see the Barrow firm with several fresh orders in hand. They are tendering for one of the five cruisers which are to be built and are being put out by the Government with the idea of finding employment for some of the unemployed. It is very possible that Barrow will build one of these vessels. They did not tender for the destroyers. These cruisers are not a very big class. They are a sort of protected scouts, but they will find work for many hands. There are hopes that Vickers' will be able to secure an order for one of the channel steamers which are being tendered for in this country. An Italian firm is contemplating the ordering of two or three turbine fliers and Vickers', with the success that crowned their efforts in connection with the Isle of Man Steam Packet steamer *Ben-my-Chree* still fresh in people's minds, should stand a very good chance of securing an order for one. Submarine work is still developing, but everything now in connection with these vessels is being kept rigidly secret and nothing leaks out. Vickers' are bound to secrecy by the British Admiralty and the Barrow firm are keeping their bond to the letter.

The "Dreadnoughts."—Both the British "Dreadnought" *Vanguard* and the Brazilian *St. Paolo* could be launched at any time now, but the widening of the Buccleuch Dock passage-way is keeping them behind. It must be understood that work is not stopped on either, but they are both a big weight now and they would be better launched. It is most likely that they will be launched at the beginning of the year. It all depends upon the widening of the passage, and if the work is pressed on with, then one or both may go into the water in December. In connection with the *Vanguard*, Vickers' are building the guns for this vessel. Thus they are practically the only firm in the world that is building a battleship shell, putting boilers and turbines of their own construction in and then completing her with all guns made in their own works and using all their own armour plating. Certainly they are unique in this respect.

The *Minas Geraes*, launched at Elswick—the first of the Brazilians—has received her engines and boilers from Vickers'. One of the largest cargoes of boilers and engines on record was dispatched from Barrow shortly after the launch of that vessel. The other sets for the Barrow-built battleship are about complete. With regard to the third, very little is known at present. The hull will be built at Elswick and the boilers and propelling machinery at Barrow. It is interesting to note that this third vessel is to be driven by turbine engines on the Parsons principle. It is more than likely that both vessels completing now will be ready for delivery before that third keel is laid down. Brazil still sticks to the story that these vessels are for Brazil, and the weekly journals still state that they will never see Brazil except as warships belonging to a friendly country paying a courtesy visit.

The Douglas Fleet.—The *Ben-my-Chree, Viking, Empress Queen, Prince of Wales, Queen Victoria* and the *Mona*, which are owned by the Isle of Man Steam Packet Co., are now lying up for the winter months at Barrow and the Company's own staff are overhauling them. Of course Vickers' will handle the more important work. The Furness Railway Co. have made special berths for these steamers to lie up at.

The "Rurik."—We have heard the last of the *Rurik* and the many papers which threw mud at this magnificent cruiser and the builders have retired into oblivion. A naval correspondent writes that now Russia has begun to re-build her Navy, other European nations are watching her methods and types. Russia's first step has certainly been a sound and safe one. In the *Rurik* that country possesses a splendid cruiser, almost worthy to be ranked as a battleship, and every precaution has been taken that the vessel should fulfil the terms of the contract. Vickers' Company are certainly to be congratulated upon the way in which their splendid ship has come out of the searching tests applied to her, tests far longer protracted and far more exacting than those officially fixed by the British Admiralty. An expert Russian commission has superintended these operations and expressed itself completely satisfied, accepting the vessel without demur. The *Rurik* contains many novel experiments, a new feature being the provision of special range-finding towers in lieu of the familiar "spotters'" position on the mast, while on her speed trials she did 22 knots with only three-quarter boiler power, thus possessing a great reserve of boiler power. Her armour is splendidly arranged adequately to protect all vital parts, and altogether the *Rurik* is an admirable nucleus round which to build up a powerful and thoroughly up-to-date fleet. It is pleasing to read such an opinion, which is by no means overdrawn and which has been voiced many times in these notes.

The Buccleuch Dock Bridge.—Messrs. Handyside, of Derby, have completed the 100-feet bascule bridge that spans the Buccleuch Dock widened passage way. It is now working and should prove a very easy bridge to handle. Instead of working on a shaft it rolls on a quadrant and is worked by hydraulic machinery. It is so efficiently balanced that three men can lift it by hand-worked machinery. The old swing bridges are now in pieces and Messrs. John Aird's men are engaged cutting out the twenty feet of concrete and masonry in order to make the passage way 100 feet wide. When this is done the two "Dreadnoughts" will be launched and will pass through to the new wharf that Vickers' have fitted up.

Hæmatites.—There has been more life in the hæmatite iron trade, but not sufficient to put any more furnaces in blast. Prices have improved slightly and then fallen back a little. It is only in special irons such as manganese and speigeleisen that there is anything like a good demand. Mixed numbers are quoted at 60/- per ton net f.o.b., while warrant iron, in which little is doing, is at about 59/- per ton net cash. The steel trade is dull taking it altogether. The West Cumberland mills are fairly employed, but the Barrow works, with the exception of the small wire departments, are idle and it is feared that this year will not see them re-start.

Shipping.—The shipping trade is very quiet and freights are poor. Many vessels are lying up. The shipment of iron and steel from West Coast ports to date this year are no less than 307,000 tons behind the same period of 1907. This will give some idea of the stagnation that has existed in the trade of this district in 1908.

SOUTHAMPTON.

(From our Own Correspondent.)

The R.M.S.P. Co.'s refrigerated hulk *Rothay*, late *Duleep Singh*, left Southampton on the 5th October last in tow of

the London tug *Arcadia* for Vigo, *en route* for the River Plate, where she will be employed for the carriage of chilled meat. The vessel was built in the Mersey in the year 1864, and previous to her purchase by the R.M.S.P. Co. had been stationed at Gibraltar as a Government store ship.

During her stay here very extensive alterations were made and the vessel is now equipped in a very elaborate manner for the carriage of chilled meat. The work of fitting out the 'tween decks and holds with meat rails, etc., was carried out by the Liverpool Refrigeration Co. The holds are fitted with a special system of bar runner rails and trolley meat hooks and chains, so that a carcase can be run from end to end of the hold, thus facilitating rapid stowage. Messrs. Bell & Burnie, of Liverpool, constructed insulated trunk hatchways and executed the various work required in connection with the insulation. The whole of the decks were covered with "Conolite," manufactured and laid by Messrs. W. Gray & Co., of West India Dock Road. The R.M.S.P. Co.'s shore staff fitted new steam winches, windlass, derricks, etc., and erected extensive quarters under the poop for the accommodation of the crew, and when the vessel left Southampton she was fully equipped for her long tow, and given a safe passage she has still many years of useful service before her.

The Steam Yacht "Eros."—We reported in our September issue that this vessel had sailed for Monrovia as a gunboat for the Liberian Government, but she did not get away until the beginning of last month, meanwhile she was at Portsmouth having guns and mountings fitted. She is commanded by Captain J. M. Bugge, a British naval lieutenant, and a white crew are taking her out. On arrival at Monrovia she will be manned by a native crew and, as previously mentioned, will be engaged in preventing smuggling and slave trading on the coast.

The Parsons Motor Co.—In addition to the work mentioned in our October issue, the following orders are going through the works :—A 14-H.P. engine set for Sweden, which makes the eighth engine recently supplied, and a 14-H.P. engine and propeller set for the new 26-ft. launch for H.M. Customs for this port. Work is in hand for the 120-ton schooners *Orelia* and *Lisette*, also for the following :—Lord Dundonald's cruiser *Jeanette*, Mr. Greenhill's launch *Sigritta*, which is of 40 H.P. Colonel Hobart's yacht *Anolis* has been fitted with a 7-H.P. Parsons engine and propeller set as auxiliary power, and has just completed a satisfactory trial.

H.M.S. "Gladiator."—The efforts of the Liverpool Salvage Association in connection with the salving of the above cruiser were brought to a successful termination on Saturday, the 3rd October last, when the vessel was safely towed into Portsmouth, where she was finally dry docked. The task of salving the ship was an event in which not only the Government and the Salvage Association were deeply concerned, but one in which the whole nation took a deep interest, and the successful termination has given everyone cause to be proud of the manner in which this extremely difficult salvage work has been carried through to the desired end. Local interest centres round the impending legal battle which is to decide who is to pay the bill, the Admiralty or the American Line, as the former have appealed against the decision of the Court which affirmed that "the *Gladiator* was alone to blame."

Messrs. J. I. Thornycroft & Coy., Ltd., successfully launched torpedo boat No. 31 from their Woolston Yard on Saturday the 10th October last. Her guns and torpedo tubes are being fitted and she is preparing for her trials.

Torpedo boat No. 32.—This vessel is expected to be launched early this month. The armament consists of two 12-pounder guns and two 18 in. torpedo tubes, and the speed is to be 26 knots. The ocean-going destroyer *Amazon* left Southampton on the 15th October last for her official full speed trial on the Clyde and on her return will be completed for delivery. The *Nubian*, a sister vessel to the *Amazon*, is nearing completion, and the rudder brackets are being fitted.

The s.s. *Passo de Obligado*, the first of five river steamers of shallow draught and with other special features, for South American river service, was launched on October 15th. The ceremony was performed by Mrs. Caminos, the wife of Capt. Caminos, of the Argentine Navy, under whose supervision the vessels are being constructed. They are building to the order of the "Marina Mercante Argentina," a company recently formed for developing navigation in that and the surrounding country, and especially to tap the rich region through which the Parana, Uruguay, Paraguay and other rivers run. The dimensions of the *Passo de Obligado* and her sister vessels are 220 ft. in length, 33 ft. breadth, 8 ft. draught, and a speed of 10 knots is anticipated under ordinary working conditions. The machinery is "Thornycroft" type twin-screw, triple-expansion, surface-condensing, steam being supplied by two marine type return tube boilers. The hull is built throughout of S.M. steel, and the vessel will be classed 100 A1 Lloyd's. To facilitate handling cargo, several powerful winches will be installed on each ship, while to provide for lengthy freights, such as timber, etc., specially large cargo hatches have been made. The arrangements generally are such that the boats are particularly adapted for working in the very hot climates met with in the northern parts of the rivers. All five vessels will be navigated to Buenos Aires under their own steam and their fuel capacity is ample for such a journey. The new company (The Marina Mercante Argentina) is of special interest, as its formation has been solely the desire of interested people in the country to have a line of steamers which are national property.

Messrs. Day, Summers & Co. have just completed machinery and cradle for a 600-ton hauling up slipway for Milford. This set is the twenty-sixth set of machinery of this class which the firm have constructed. The largest set yet supplied was delivered last year to the order of Sir Alfred Jones, the deadweight dealt with in this case being 1500 tons. The Isle of Wight Co.'s *Queen* has had the damage sustained during the gale of September last made good, and has completed a satisfactory trial and been taken over by the company. The steamship *Courier*, which was built and engined by Messrs. Day, Summers & Co., about thirty years ago, has completed her reclassification survey and is now on her usual service. A new stern has been built for Mr. C. G. Assheton-Smith's steam yacht *Amalthæa*, which has given the vessel a very smart appearance, the new stern having a handsome sheer. The steam tug *Hercules*, which recently underwent considerable alterations and repairs, has arrived at Rangoon after a satisfactory voyage, and has been taken over by the Rangoon Port Trust.

BELFAST.

(*From our Own Correspondent.*)

State of Trade and Prospects.—The shipbuilding trade of the port shows signs of increasing briskness, and there is every evidence that the New Year will see the various yards taxed to their fullest capacity.

Messrs. Harland & Wolff.—When the berths which are at present in course of preparation for the big White Star liners *Olympic* and *Titanic* are completed, all the slips in the north and south ends of the yard will be required, for, in addition to the above-mentioned vessels, the Queen's Island firm has several other important orders in hand. As it is at present, all the available berths are occupied with vessels in various stages of construction. At the south end the keel of a new steamer for the Royal Mail Steam Packet Company has been laid down, and on the outside berth at the same end there is a large twin-screw steamer named *Minnewaska* for the Atlantic Transport Company. This vessel will be ready for launching in the course of a few weeks. At the fitting-out wharves there are the Red Star liner *Lapland*, the White Star Company's Canadian liner *Laurentic*, and the Elder-Dempster steamer *Leopoldville*. The last-mentioned vessel will shortly be ready for sea. Messrs. Harland & Wolff have been awarded the Grand Prix for their exhibit in the shipping section of the Franco-British Exhibition. Steering gears similar to those fitted in the *Adriatic*, the *Rotterdam*, the *Amerika* and other liners constructed at the Queen's Island were exhibited ; while the models included those of the White Star liner *Cedric* and the P. & O. liner *Marmora*.

At the time of writing, an exhaustive series of tests of the new 150-tons floating crane is being brought to a conclusion with the final test load of 200 tons. A photo and particulars of this huge structure appear elsewhere in the present issue.

Messrs. Workman, Clark & Co.—This firm also has a considerable amount of new tonnage under construction. On 17th October the twin-screw steamer *Tainui*, built by them to the order of the Shaw, Savill and Albion Company, had a

most satisfactory trial trip. The *Tainui* is a vessel 493 ft. long, with a gross tonnage of 10,000 tons, and has been specially designed for the Company's New Zealand trade. In addition to extensive cargo capacity the steamer has accommodation for 120 first and second-class passengers, and for about 330 third-class. The propelling machinery consists of two sets of triple-expansion engines developing 6500 I.H.P., steam being supplied by six single-ended boilers working under forced draught. Before these notes are in print the Holt liner *Theseus*, which has been built and engined by Messrs. Workman, Clark & Co., will have proceeded on her trial trip.

Repair Work.—This branch of the shipbuilding industry has been brisker of late. Messrs. Workman, Clark & Co. have completed the repairs to the London steamer *Bramley*, referred to in last month's issue. They have at present in hand for extensive bottom damage repairs the Newry steamer *Retriever* and the Cardiff steamer *Portsmouth*. The contract for the work at the latter vessel was taken in keen competition with other ship-repairing firms in various centres. In addition to their usual amount of running repairs Messrs. MacColl & Co. have recently carried out extensive damage repairs to the Glasgow steamer *Dunsford*; also machinery repairs to the steamer *Earlford* belonging to the same owners. Messrs. Mann, Macneal & Co., of Glasgow.

JUNIOR ENGINEERS.

CONSIDERING the action of a planing tool, as in Fig. 1, the object is to remove the material in a succession of sheared layers, forming shavings, by means of the compressive force of the tool face AB. The shear lines ab lie at an angle, more or less acute to AB, and their inclination is governed by the structure of the material. As the tool point B is pressed forward, the material first gives by compression, up to the limit where the resistance to crushing on the plane bb is greater than the resistance to shearing along the plane ab, when the layer begins to slide up the tool face, and the point B commences to remove another similar layer.

If a wrought-iron shaving be examined, it will be seen to consist of a number of these sheared layers, held together by a slight cohesion of the particles, showing that the structure of the material has not been entirely broken down, but only sufficiently to allow of the tool passing, by the curling of the shaving up the face of the tool; and although the elastic limit has been passed, there is still sufficient tension in the fibres for them to hold together. In the case of cast iron, it will be noticed that the sheared layers are all, or nearly all, separate, due to the low tensile strength of cast iron, the material having been broken down entirely.

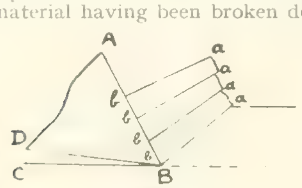


Fig. 1

Fig. 2.

Obviously, if the tool face be made vertical, the material is simply pushed forward and not strictly cut, so that the tool angle ABC is limited in this direction by the excessive power required to force the tool. At the other extreme is the case of the wood-paring chisel, as in Fig. 2, the shavings of which, across the grain, are in a similar state of partial shear, the shear planes being very short and only slightly longer than the thickness of material removed, due to the keenness of the edge.

With the metal-planing tool, the edge, if to any degree keen, would be easily dulled, if not broken, and hence this limits the acuteness of the angle ABC, or more correctly here, the angle ABD, CBD being a constant for clearance and ranging from 3° in most tools, up to 7° or 10° in special cases; this clearance, bottom rake, or backing off, as it is variously termed, is to prevent the tool jamming on, or causing friction with, the planed surface.

The compromises between these limits, for the tool angle ABC, commonly adopted in practice are 60° for wrought iron or mild steel, 70° for cast iron, and 80° for brass, these being employed with a clearance of 3°. The complement of these two angles, or the inclination of AB to the vertical, is termed the front rake.

During every working stroke of the planer table the metal is removed in a strip, the side of which, next the uncut surface, must be torn away from the material supporting it, and therefore a cutting edge and a clearance angle must be given to this side of the tool. Thus, in Fig. 3, the upper portion of which diagram represents a section at II., angle CBD is the clearance, as before, and ABC represents the cutting angle, the actual tool angle being ABD.

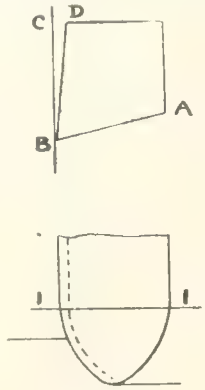


Fig 3

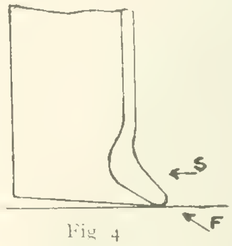


Fig 4

In this case, if ABC were a right angle, merely a scraping effect would be produced, with excessive friction; while, if very acute, the tool would dig into the metal or dull the edge. The side angles employed in practice are, 70° for wrought iron, 75° for cast iron, and 80° for brass; with a clearance angle of 3°, as before. The inclination of this side cutting face, or the complement of the clearance and tool angles, is here termed side rake; the side rake is thus rather less than the front rake for the same materials.

Now, referring to Figs. 1 and 3, it is seen that the intersection of the two angles ABD will produce a sharp corner at D, and as this would be inevitably broken off, the tool is therefore rounded away as in the lower portion of Fig. 3, and a tool similar to Fig. 4 is obtained, in which S denotes the side rake and F the front rake.

In order to grind the tool to these angles, to within any degree of accuracy, it is obvious that a gauge of some sort must be employed; and where a properly constituted tool store exists, this is actually done. In perhaps the majority of workshops, however, the operative grinds his own tools, and works out his own salvation, guided by the eye of experience, suiting the angles to the job according as it is hard or soft, steel or wrought iron, chilled or grey cast iron, hard

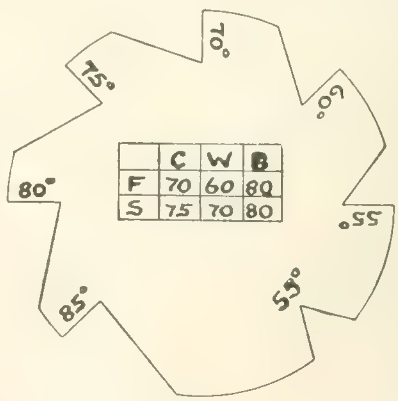


Fig 5

gun-metal or soft brass, and clean or dirty metal; if the tool lying handy will not keep its edge, another is tried. Where the experience is lacking, a gauge, if not a necessity, will materially help in gaining that experience, even if it does nothing more than divert the mind to a grasp of the principles that underlie the uses of cutting tools. Such a gauge can be easily made from a piece of sheet brass, 2 inches diameter, as shown in Fig. 5.

The table on the gauge refers to cast iron, wrought iron, and brass, for front and side rake, the clearance angle being 3° in all cases. The two 55° angles are, one for screw cutting tools, the other for a front rake often used for wrought iron, the 85° angle being one which is sometimes employed for very hard gun-metal.

The foregoing angles are for roughing tools only. In taking the finishing cut off a rough-planed surface, the depth of cut is negligible, so that no side rake is required, and the tool need only have a front-raked straight edge; obviously, too, the surface of the material has not the same strength or hardness that the skin of a forging or casting possesses, and the edge can thus be made keener. This keenness of edge is often obtained by hollowing out the face of the tool, thus keeping sufficient material close up to the edge to stiffen and support it. With a broad-faced, finishing tool, working on soft or medium brass, the edge has a tendency to dig into the work and score the surface; this is remedied by using a tool similar to the lower portion of Fig. 3, in which the point of the tool is made somewhat more round, and to which no side rake is given and only a moderate front rake.

In planing the side face of a job, whether angled to the table or vertical, the roughing tool may be forged with the nose bent over to suit the angle; the position of the tool being further assisted by the swivel tool box, which can be slewed partly round the arc of a circle whose centre is somewhere in line with the tool, vertically. For finishing purposes, a special side tool is necessary, so forged, that the cutting edge is vertical instead of horizontal, the bottom end of the tool being bent out to the side slightly in order to clear the shank.

OBITUARIES.

Harry Jeffries.—We regret to record the death at Bombay, on July 25th, of Harry Jeffries, M.I. Mar. E., of 57, Holmesdale Road, Highgate. Whilst ashore, he caught a chill, which developed into enteric fever, and after a comparatively short illness in hospital, he succumbed to that terrible malady at the early age of 31 years, and was interred in Sewree Cemetery. Educated at the Highgate Board School, he showed conspicuous ability and gained one of the Hornsey Exhibitions (a technical scholarship of £15 per annum), in virtue of which he attended classes at the Polytechnic Institute, Regent Street, for three years, with painstaking industry and that conscientious attention to duty which distinguished him. In July, 1894, he was apprenticed to Messrs. Simpson and Co., engineers, Pimlico, continuing to study at evening classes. In 1895 he passed advanced second in magnetism and electricity, and in 1896 in machine drawing, applied mechanics and steam. The next year he passed in advanced theoretical and practical chemistry. All through his brief life he was an earnest thinker and hard worker—never happier than when engaged in the pursuit of knowledge. In 1902 he joined the Asiatic Steam Navigation Co., of Liverpool and Calcutta, as fifth engineer, under a three years' agreement in the East, which was renewed on expiration. He obtained his second and chief's certificates, in both instances at the first attempt, and when he returned home on leave after the prolonged absence, he so applied himself that he obtained his extra chief's certificate. On the expiry of his leave, he was appointed second engineer of the new steamer *Bahadur*, and left Glasgow in August, 1907, for the East. The suddenness of his premature death came as a great shock to his parents and his many friends—who looked forward to a life so full of promise. Captain Grebbin, of the *Bahadur*, in expressing on behalf of himself and officers deepest sympathy with his parents in their great bereavement, adds, "He was liked by us all as a quiet, unassuming, clever engineer."

Engineer-Captain R. W. Edwards, R.N. The death of this officer so suddenly on October 3rd, while away in the North of Scotland cruise in the *Agamemnon* on duty as staff engineer with a division of the Home Fleet, gave a shock of grief to many engineers by whom he was well known as a good comrade and reliable friend, as well as to a large circle beyond, by whom he was admired and esteemed for his efforts to maintain and enlarge the possibilities of engineers in their own particular sphere of action. His remains were conveyed to Sheerness on board the battleship on which he died, and were interred with the honours due to his station and reputation, amid the regrets of all with whom he had been associated. Engineer-Captain Edwards served as a student in H.M.S dockyard at Keyham, and joined the Royal Navy in 1874. He was promoted through the various grades to that of Fleet Engineer and during his long service of thirty-four years he maintained an excellent record. On several occasions he was within the fighting zone, and while the South African war was under way, he served in the *Powerful* as Fleet Engineer with credit and distinction in his own special department, and rendered considerable assistance in directing and advising where his engineering training and skill were required outside the engine room. He took a keen interest in the proceedings of the Institute of Marine Engineers, of which he

The Late Engineer-Captain R. W. Edwards, R.N.

was a member and a vice-president as representative of the engineers of the Royal Navy. By a singular coincidence as to the date, Engineer-Captain Edwards responded on behalf of the Royal Navy to the toast of "The Imperial Forces" at the annual dinner of the Institute, on October 3rd, 1906, when Lord Pirrie presided. Deep sympathy has been expressed towards Mrs. Edwards and family on account of the great loss which has befallen them so suddenly, and we unite in offering our respectful regrets. The Lords of the Admiralty have honoured his memory by conveying to his widow their great appreciation of his zealous and life-long service, and deploring also the loss the Naval service has suffered by his decease.

Bennett H. Brough.—It is with regret that we have to announce the death of Mr. Brough, the well-known secretary for fifteen years of the Iron and Steel Institute, which took place at Newcastle-on-Tyne on October 3rd.

LAUNCHES AND TRIAL TRIPS.

LAUNCHES—English.

Screw Steamer.—On September 24th, there was launched from the yard of Messrs. R. Williamson & Sons, at Workington, a steel screw steamer of the following dimensions: Length, 119 ft. 3 in.; breadth, 22 ft.; depth moulded, 10 ft. 6 in. She is designed to carry about 300 tons deadweight on Lloyd's freeboard. She is built to the highest class and will be fitted with compound surface condensing engines, having cylinders 15 in. and 32 in. by 22 in. stroke.

Port Inglis.—On September 28th, Messrs. Irvine's Shipbuilding and Dry Docks Co., Ltd., West Hartlepool, launched the handsome steel screw steamer *Port Inglis*, built to the order of Messrs. Furness, Withy & Co., Ltd. She is of the following dimensions: 289 ft. 6 in. by 40 ft. 2 in. by 20 ft. 6½ in. having single deck poop, bridge and top-gallant forecastle, and has been built to the British Corporation Registry's highest class. A double bottom is fitted throughout on the cellular principle and the after peak is arranged as a trimming tank. She is constructed with bulb angle frames and longitudinal stringers, giving clear holds for the storage of bulky cargoes, and the bulwarks have been specially strengthened for the carriage of deck cargoes. Four watertight bulkheads divide the holds into five watertight compartments. She also has extra large cargo hatches, four steam winches, which are supplied with steam from a Cochran (Annan) donkey boiler with patent seamless furnace, and is replete with the latest improvements for rapid loading and discharging. A powerful quick-warping steam windlass is fitted forward for the working of the cables, and steam-steering gear is fitted amidships with hand-screw gear aft. Accommodation for captain and officers is arranged in poop, engineers in houses amidships, crew and firemen in forecastle. The cabins throughout have been heated with steam and the sanitary, ventilating and lighting arrangements have received special attention and have been effected on the most approved lines. Triple-expansion engines are being supplied and fitted by Messrs. McColl & Pollock, Sunderland, having cylinders 20½ in., 33 in., 54 in. × 36 in., two large S.E. boilers, 180 lbs. pressure. The christening was gracefully performed by Miss Annette Furness. Amongst those present were the following: Miss Hateley, of Chicago, who is at present staying at Grantley Hall, Mr. and Mrs. S. W. Furness and Master Furness, Mr. Marmaduke Furness, Captain Brackenbury, Mr. Weatherall, Mr. Purdon and Mr. Harris.

Flandria.—On October 7th, Messrs. Short Brothers, Ltd., launched from their shipbuilding yard, at Pallion, Sunderland, the s.s. *Flandria*, built to the order of Messrs. T. Nolson & Sons, for the Ghent Lloyd of Ghent. The vessel, which will take the highest class at Germanischer Lloyd, is 292 ft. in length, 41 ft. beam, and 20 ft. 7½ in. depth moulded, and will carry a cargo of 3,400 tons on a moderate draught of water. She is constructed on the deep frame principle, with one deck laid, cargo poop, extra large bridge and top-gallant forecastle. Water ballast is provided for throughout the double bottom, and in both fore and after peaks. Comfortable accommodation is provided for the captain, with saloon handsomely panelled in polished hardwood, and for the officers and engineers in houses on the bridge deck, the crew being berthed in forecastle. Five steam winches, steam windlass, steam steering gear amidships, with rods and chains to quadrant and controlled from standards on upper and lower flying bridges are fitted, all driven from a large donkey boiler fitted in stokehold. The propelling machinery is by the North-eastern Marine Engineering Co., Ltd., Sunderland, and consists of engines with cylinders 20½ in., 33 in., 55 in. diameter and a stroke of 36 in., driven by two multitubular boilers working at 180 lbs. pressure. During construction the hull and machinery have been under the supervision of Mr. P. J. Gootbleet, of Antwerp. The christening ceremony was gracefully performed by Mrs. Short, of Sea View, Sunderland.

Esperanto.—On October 12th, there was launched from the shipyard of Messrs. Cochrane & Sons, shipbuilders, Selby, a handsomely modelled steel screw cargo steamer, the principal dimensions of which are 115 ft. by 22 ft. by 9 ft. moulded. The vessel has been built to the order of Messrs. T. Beckwith and Co., of Colchester, will be fitted with compound surface condensing engines by Messrs. Crabtree & Co., Ltd., of Great Yarmouth, and is replete with all the latest improvements for this class of vessel. As the vessel left the ways she was gracefully christened the *Esperanto*, by Mrs. A. Cochrane, Senr., of Hull.

Stamboul.—On October 12th, there was successfully launched from the shipbuilding yard of Messrs. Wood, Skinner and Co., Ltd., of Bill Quay, Newcastle-on-Tyne, a new steel screw steamer, which has been built by them for Norwegian owners. The vessel is of the single-deck type with poop, bridge and top-gallant forecastle, and has been built to the requirements and under the special survey of Lloyd's for their highest classification. Water ballast is provided in the cellular double bottom all fore and aft and also in the fore and after-peak tanks. The saloon, captain's accommodation and spare berths, etc., are arranged in a large house on the bridge deck amidships, the officers' and engineers' berths being in side houses at after end of bridge deck, while the crew are berthed in the top-gallant forecastle. She will be fitted with every improvement and appliance for facilitating the rapid loading and discharging of cargo and general working and navigation. The engines, which are of the improved triple-expansion type supplied with steam by two large steel multitubular boilers, have been constructed and will be fitted by Messrs. The North-Eastern Marine Engineering Co., Ltd., of Wallsend-on-Tyne. As the vessel left the ways, she was gracefully christened *Stamboul* by Miss Edith Skinner, of Westoe, South Shields.

Kilnsea.—On October 14th, there was launched from the yard of Earle's Shipbuilding and Engineering Co., Ltd., Hull, a handsomely modelled steamer built to the order of Messrs. Brown, Atkinson & Co., Ltd., Hull. The principal dimensions are: Length, 352 ft.; breadth, 49 ft. 6 in.; depth, 24 ft. 3 in. moulded. She has been constructed of steel to Lloyd's 100 A1 class (one deck rule), to the Board of Trade requirements, also to Italian, French and Suez Canal tonnage certificates, and is designed for carrying a large quantity of water ballast in the cellular double bottom and in forward and after-peak tanks. It is estimated the vessel will carry about 6,000 tons deadweight. A deck-house has been provided amidships for the accommodation of captain, officers and stewards, having a combined chart-room and wheel-house overhead. The engineers are berthed in side houses abreast the engine casing, and the petty officers, seamen and firemen under forecastle deck. The vessel will be fitted with two steel masts, having telescopic wood pole for Manchester Ship Canal requirements, three steel derrick posts, each complete with wood derricks and all necessary cargo gear. There are eight powerful steam winches by Messrs. Lynn & Co., patent direct-acting steam windlass by Messrs. Emerson, Walker and Thompson, steam-steering gear by Messrs. Alley & Maclellan, and hand-screw steering gear by Messrs. Hastie & Co. The machinery consists of a set of triple-expansion engines, having cylinders 24 in., 39 in., 66 in. diameter by 45 in. stroke, steam being supplied by three single-ended cylindrical boilers, working at a pressure of 180 lbs. per square inch. The launching ceremony was gracefully performed by Mrs. Christopher Pickering, who christened the vessel *Kilnsea*. The hull and machinery have been constructed under the superintendence of Mr. T. H. Jenkin.

LAUNCHES—Scotch.

Mawhera.—On September 30th, Messrs. Wm. Simons and Co., Ltd., Renfrew, launched from their works one of their latest types of twin-screw stern well combined bucket suction and discharging dredgers, the *Mawhera*, which they have constructed to the order of the Greymouth Harbour Board. As customary with Messrs. Simons, the vessel was launched with all its machinery on board complete ready for work. The christening ceremony was gracefully done by Miss Wilhelmina Brown, of Kilrene, youngest daughter of Mr. William Brown, chairman of Messrs. Wm. Simons & Co., Ltd. The hull and machinery have been built to Lloyd's highest class and the bucket and pump dredging outfit embodies all the most modern improvements, and is provided with all the appliances necessary for reclaiming land. The bucket ladder is arranged so that the bucket can dredge close up to quay walls, and also cut the dredgers own flotation. The discharging pump is arranged to receive and deliver, through a long length of floating and shore pipes, the

material dredged by the suction pump or buckets. The propelling power is provided by two sets of triple-expansion surface condensing engines, each driving its own propeller. Steam is supplied from two steel boilers constructed to Lloyd's and Board of Trade requirements, for a working pressure of 160 lbs. per square inch. The propelling engines are also arranged for driving the bucket chain at two different speeds, and the suction pump and discharging pump, either in conjunction with the buckets or separately as required. The engine room auxiliary outfit includes independent automatic feed pumps, bilge pumps, service pumps, circulating pumps, condenser, feed heater and filter. The dredging machinery is of very massive design for dealing with hard material, and all parts of the gearing and bucket chain are of special hard and durable steel, so as to reduce wear and tear to a minimum. Independent steam hoist gears are provided both for ladder and suction pipe. The mooring winches at bow and stern are exceptionally strong. The dredger has been constructed under the supervision of Mr. Harry Raymond, inspecting engineer to the Greymouth Harbour Board, New Zealand.

Macquarie.—On October 14th, Messrs. William Simons and Co., Ltd., Renfrew, launched from their works a suction hopper dredger, which they have constructed to the order of the Agent-General for Tasmania. This dredger, which is of the trailing suction type, was built under the direction of Mr. J. Meilbek, A.M.Inst. C.E., London, consulting engineer to the Agent-General for Tasmania, assisted by Mr. D. Groucutt, Pollokshields, Glasgow, resident inspector. The dredger is arranged to take its load while being propelled slowly ahead. The propelling machinery consists of one set of compound surface condensing engines driving a single screw, and supplied with steam from a mild steel mutiltubular boiler constructed to Lloyd's and Board of Trade requirements. An independent set of compound surface condensing engines is to be provided for driving the suction pump. As the vessel left the ways she was gracefully named *Macquarie* by Miss Gretchen Ratzel, of St. Petersburg.

Greenland.—On September 29th, there was launched at Whiteinch by Messrs. Barclay, Curle & Co., the screw steamer *Greenland*, which they have built to the order of the Liverpool and Hamburg Shipping Co. The dimensions of the vessel are :—Length, 260 ft. ; breadth, 36 ft. ; depth, 24 ft. 6 in. ; and of 1700 tons gross. The naming ceremony was performed by Mrs. Alastair Currie.

Maria Parera.—On September 29th, there was launched at Pointhouse by Messrs. A. & J. Inglis, a twin-screw train transfer steamer, which they have built for the Entre Rios Railway Co. The vessel, which is named *Maria Parera*, is similar to the *Lucia Carbo*, launched by Messrs. Inglis early last year for the same company. She is 293 ft. in length, over all, 58 ft. in breadth, 19 ft. in depth to the level of the rails, and 37 ft. 6 in. in height to superstructures. There are three lines of rails. The machinery will be supplied by the builders.

Ventura de Larrinaga.—On October 7th, there was launched at Port Glasgow by Messrs. Russell & Co., the steamer *Ventura de Larrinaga*, which they have built to the order of Messrs. Larrinaga and Co., Liverpool. The dimensions of the vessel are :—Length, 405 ft. ; breadth, 52 ft. ; depth, 28 ft. 6 in. ; with a deadweight carrying capacity of 8500 tons. Messrs. D. Rowan & Co., Glasgow, will supply the machinery.

Alethea.—On October 10th, there was launched at Ayr by the Ailsa Shipbuilding Co., Ltd., a screw coasting steamer to the order of the Zillah Shipping and Carrying Co., Liverpool. The vessel is of the following dimensions :—Length, 156 ft. 6 in ; breadth, 26 ft. ; depth (moulded), 13 ft 1 in. ; and of 480 tons gross, with a deadweight capacity of 600 tons. She will be fitted by the builders with compound surface condensing engines capable of giving a speed of about 11 knots. The vessel was named *Alethea* by Mrs. Savage.

Cabo la Plata.—On October 10th, there was launched at Grangemouth by the Greenock and Grangemouth Dockyard Co., Ltd., the screw steamer *Cabo là Plata*, which has been built to the order of Messrs. Ybarra & Co., of Seville, for their wine and fruit trade. She is of the improved awning deck type, having three complete decks and part shelter deck. Accommodation for a limited number of passengers is provided. The dimensions of the vessel are :—Length, 265 ft. ; breadth, 38 ft. 6 in. ; depth moulded, 18 ft. 3 in. ; and with a deadweight carrying capacity of 3000 tons on Lloyd's summer freeboard. Machinery will be supplied by Messrs. Blair & Co., Ltd., Stockton-on-Tees. The vessel was named by Miss Ybarra.

Eumeralla.—On October 10th, there was launched by Messrs. Scott, of Kinghorn (Limited), to the order of Messrs. Howard Smith & Co., Ltd., Melbourne, Australia, the screw steamer *Eumeralla.* The vessel is of the following dimensions :—200 ft. long, 30 ft. beam, and 15 ft. 8 in. total depth to main deck, and is handsomely fitted up to accommodate a large number of first and second-class passengers. Immediately after the launch the *Eumeralla* proceeded under her own steam to Burntisland to take in cargo.

Malwa.—On October 10th, there was launched by Messrs. Caird & Co., Greenock, for the Peninsular and Oriental Steam Navigation Co., a twin-screw steamer of the following dimensions :—Length, 560 ft. ; breadth, 61 ft. ; depth to spar deck, 38 ft. 3 in., and 11,500 tons register. The vessel has excellent accommodation for 400 first-class and 200 second-class passengers, for whom there have been provided all comforts and conveniences, including large public rooms, divan or lounge, large laundry, and post office for the expeditious handling of mails. For ensuring the silent working of cargo, the vessel has been fitted with hydraulic gear, and has insulated cargo holds for the Australian trade, with large insulated chambers for passengers' provisions. The builders will supply quadruple-expansion engines to give a high rate of speed. Messrs. Wailes, Dove & Co.'s bitumastic enamel was applied to the bunkers. The ceremony of naming the steamer *Malwa* was performed by Miss Constance M. J. Caird, daughter of Mr. Patrick T. Caird, Belleaire, and after the launch the *Malwa* was towed by four tugs of the Glasgow and Greenock Towing Co. to Messrs. Scott's basin, where her machinery will be put on board.

Steam Trawler.—On October 10th, there was launched at Aberdeen by Messrs. A. Hall & Co., a steam trawler to the order of Messrs. Chant & Paddon, Plymouth. The vessel, which will be engined by the builders and fitted with a boiler working up to a pressure of 180 lb., measures 125 ft. long and 22 ft. broad.

Steam Trawler.—On October 10th, a steam trawler, built to the order of the Rockcliffe Steam Trawling Co., Fleetwood, was launched from the yard of The John Duthie Torry Shipbuilding Co., Aberdeen. The vessel, which will be engined by Mr. W. V. V. Ligerwood, Coatbridge, is 137 ft. long, 22 ft. 6 in. broad and 13 ft. 3 in. deep.

Yoseric.—Lately there was launched at Port Glasgow by Messrs. Russell & Co., the screw steamer *Yoseric*, which has been built to the order of Messrs. Andrew Weir & Co., London. The dimensions are :—Length, 385 ft. ; breadth, 49 ft. 9 in. ; depth (moulded), 29 ft., with a deadweight carrying capacity of 7500 tons. The machinery will be supplied by the Clyde Shipbuilding and Engineering Co., Ltd., Port Glasgow.

Remus.—Lately there was launched at Paisley by Messrs. John Fullerton & Co., a steamer of about 1500 tons deadweight capacity, which they have constructed to the order of Mr. G. B. Wadsworth, Goole, for his coasting and Continental trade. Triple-expansion engines of 900 i.h.p. are being supplied by Messrs. Ross & Duncan, Govan. The steamer was named *Remus* by Miss Milne, Middledrift, Helensburgh.

TRIAL TRIPS.

Copsewood.—On September 21st, the steel screw steamer, *Copsewood*, built by Messrs. Robert Thompson & Sons, Ltd., Southwick Yard, for Messrs. the Meteor Steamship Co., Ltd., of Middlesbrough, was taken out to sea on her official trial. She is built to take the highest class in Lloyd's, and her principal dimensions are: Length B.P. 176 ft., breadth, 29 ft. 10 in., and depth moulded, 13 ft. The erections consist of raised quarter deck, covering the engine and boiler space, bridge amidships for the accommodation of officers and engineers,

a large steel house on the bridge for captain, having chart-house and saloon entrance adjoining, with flying bridge above, and top-gallant forecastle for accommodation of crew. Ample water ballast is provided in the double bottom and fore and after peaks. There are three large hatchways worked by powerful steam winches by Messrs. John Wigham & Son, with steam from the main boilers, and arranged for the quick loading and discharging of cargo; quick-warping steam windlass by Messrs. Emerson, Walker & Thompson Bros., Ltd.; and steam and hand-steering gear by Messrs. Alley & MacLellan, Ltd., Glasgow. The engines are by Messrs. MacColl and Pollock, Ltd., of Sunderland, of the triple-expansion type, having cylinders 15½ in., 25 in. and 41 in., by 27 in. stroke, with two boilers of ample power. The vessel had a good run round to Middlesbrough, maintaining a speed of over ten knots, against a strong tide. Mr. Wm. Constantine, on behalf of the Company, expressed himself highly satisfied with the ship and engines.

Saranac.—On September 21st, the handsome steel screw steamer *Saranac* (of which we gave particulars in our August issue, page 26), built by Messrs. W. Gray & Co., Ltd., West Hartlepool, for the Anglo-American Oil Co., Ltd., London, was taken to sea for her official loaded trial. Progressive runs were made and a maximum speed of about 11½ knots obtained. The performance of the vessel and the working of the engines and boilers were very satisfactory in all respects. Amongst those on board were Mr. Archibald McLean (manager of the shipping department), and Mr. G. Hume (superintendent), representing the owners, Mr. Eckman and others. The shipyard was represented by Capt. J. E. Murrell and Mr. F. W. Purvis, and the engine builders by Mr. Maurice S. Gibb and Mr. J. B. Williams. Messrs. S. T. Taylor & Sons of Scotswood have covered the whole of the boilers, cylinders, steam pipes, etc., with special high-class non-conducting material.

Konakry.—On September 23rd, the fine steel screw cargo and passenger steamer, *Konakry* (of which we gave particulars in our September issue, page 58), built by Messrs. Sir Raylton Dixon & Co., Ltd., of Cleveland Dockyard, Middlesbrough, with the Cantilever frames on the patents of Harroway and Dixon, John Priestman, and Livingstone & Sanderson, to the order of Messrs. Elder, Dempster & Co., of Liverpool, proceeded to sea for her official trials, which passed off most successfully, and afterwards the vessel proceeded in ballast condition under the command of Captain William Owen. The hull and engines have been constructed under the supervision of Captain W. P. Thompson, the owners' marine superintendent, and Mr. James B. Wilkie, their superintendent engineer, with Mr. W. L. Roxburgh, as resident superintendent.

Charleston.—On September 26th, the new steel screw steamer *Charleston* (of which we gave particulars in our October issue, page 91), built by Messrs. Irvine's Shipbuilding and Dry Docks Co., Ltd., to the order of Messrs. Furness, Withy & Co., Ltd., proceeded to sea on her trial trip. The ship and engines gave every satisfaction to the owners' representatives, Captain Brackenbury and Mr. T. Tose, a mean speed of 10½ knots having been attained on the runs. The vessel is supplied with a Cochran (Annan) donkey boiler with patent seamless furnace.

Stigstad.—On October 1st, the handsome steel screw steamer *Stigstad*, built by Messrs. W. Gray & Co., Ltd., West Hartlepool, to the order of Messrs. A. F. Klaveness & Co., of Christiania, was taken out on her trial, when a speed of over 11½ knots was attained. This vessel (of which we gave particulars in our September issue, page 58), is of particular interest to shipowners, owing to her being fitted with McGlashan's patent side tank arrangement, which may briefly be described as an inner shell fitted inside, and about 2 ft. 6 in. from the skin of the ship and extending from the boiler room to the collision bulkhead, a length of about 266 feet. This shell not only forms water ballast tanks along the sides of the vessel, which may be used for quick trimming, but adds considerably to the strength and safety of the vessel. Another feature of interest to ship-owners is the large clear holds, clear of obstructions—made possible by the side tank arrangement of construction—which are particularly adapted for use when grabs are used for discharging the vessel. The side and bottom tanks have a capacity of over 2,800 tons of water ballast. Of this quantity, about 900 tons can be run out, whilst the remainder is being pumped out by the two powerful pumps fitted in the engine room. The whole of the water ballast tanks may be emptied in five hours. On the trial trip, the owners were represented by Mr. Klaveness, Captain Raastad and Mr. Nicol, superintendent-engineer; Messrs. Olaf Arneson and S. J. Schjelderup represented the Norske Veritas, Captain J. E. Murrell, the shipbuilders, and Mr. Maurice S. Gibb, the engine builders.

Ganda.—On October 6th, the s.s. *Ganda* (of which we gave particulars in our October issue, page 91), built by Messrs. Short Bros., Ltd., to the order of Messrs. T. Nolson & Co., for the Ghent Lloyd Société Anonyme, of Ghent, left the Wear for her official trials, when the vessel maintained a speed of 10 knots. Amongst those present were Mr. T. Nolson, Mr. R. Nolson and Mr. L. Nolson, Mr. Spaey, Mr. Joseph Short (managing director of Short Bros., Ltd.), Mr. Weir (representing North-Eastern Marine Engineering Co., Ltd.), and other friends.

Jamaica.—On October 7th, the s.s. *Jamaica*, which has been built to the order of Messrs. Elder, Dempster & Co., of Liverpool, for the Imperial Direct West India Mail Service Co., Ltd., of Bristol, was taken by her builders, Messrs. W. Harkess and Son, Ltd., of Middlesbrough, for her official trials in Tees Bay, when the guaranteed speed of 12 knots per hour was easily obtained on a light consumption of coal, and everything worked to the entire satisfaction of the owners' representatives and the company on board. This vessel is a very complete example of the modern cargo and passenger steamer. She has accommodation for forty-four first-class passengers amidships, the state-rooms being exceptionally large and well lighted and ventilated, having two 12 in. side-lights fitted to each room, Lœuvre ventilators to each door, also patent torpedo air extractor to each room in addition to the usual cowl ventilator. The beds are all of enamelled iron with wire-wove spring mattresses, and the rooms are fitted with the usual folding lavatories, patent lifebelt racks, silent door hooks, etc., whilst a large number of the rooms are deck cabins. The smoke-room entrance is off the bridge deck; it is panelled in wainscoat oak with Spanish mahogany dado; the seating is of green moquet, and it is comfortably furnished with card tables, revolving chairs, etc. In the centre of the room a handsomely designed stairway in polished hardwoods leads to the saloon and accommodation below. At the head of the stair is a bar, the fittings of which are of polished mahogany throughout, and it has a stained glass service window looking on to the smoke-room. The dining saloon, which has seating accommodation for forty-four, is of polished wainscoat oak throughout, the entrance is through two glass swing doors at the foot of the stairs, and it is also upholstered throughout in green moquet. A large pantry, with service window facing saloon entrance, is fitted up in polished mahogany, and has every convenience, including steam hot press, for serving a large number of passengers. Two bath-rooms, a large lavatory, and three w.c.'s complete this portion of the accommodation. The second-class accommodation for twenty persons is placed in the poop aft. In this case, the state-rooms are each for four passengers; they are fitted with iron beds and spring mattresses. Special attention has been given to the ventilation, which is of a complete nature, and a bathroom and two w.c.'s are attached to this portion also. The sanitary arrangements throughout are of a very complete nature, water service led from special sanitary tanks being laid to all parts of the ship. Third-class accommodation for a large number is provided under the bridge amidships, entering off the main deck, and the vessel carries a Board of Trade passenger certificate with accommodation for 230 passengers, and further, has a No. 5 certificate for 1,050 deck passengers. The electric light installation is of a comprehensive nature, every part of the ship being lighted by electricity, there being considerably over 100 lights in all, in addition to cargo clusters and arc lamps. The vessel has cold storage for about ten tons of meat and provisions, the refrigerating plant being on the CO_2 principle. The whole of the decks are of steel sheathed with yellow pine, and a spacious promenade deck is provided for the first-class passengers on top of the smoke-room, with captain's state-room and chart-room built of teak on top, promenade deck, poop and forecastle being covered with permanent wood awnings, whilst canvas awnings are fitted to the remainder of the decks throughout. The *Jamaica* has been specially

built to trade between Jamaica and the neighbouring islands in connection with the Imperial Direct West India Mail Service. She is specially adapted for ensuring the comfort of passengers in hot climates, and the owners confidently expect that by placing a vessel of this description upon the service, they will induce passengers and tourists to avail themselves of the opportunity thus afforded to enjoy the magnificent scenery and climate, which are features of the portion of the West Indies which the s.s. *Jamaica* is to serve. The dimensions of the vessel are 220 ft. by 34 ft. by 16 ft. moulded ; she is designed to carry a deadweight of 1,300 tons on 14 ft. draught of water, and is fitted with every modern appliance for the rapid handling of cargo. Her engines are of 1010 I.H.P. and have been supplied by Messrs. MacColl and Pollock, Ltd., of Sunderland. The vessel and machinery are built to Lloyd's 100 A1 class and Board of Trade requirements for passenger certificate, under the superintendence of Mr. W. L. Roxburgh, resident surveyor. On completion of her trials, she proceeded direct to Jamaica under the command of Captain Howell.

Sargasso.—On October 8th, the new screw steamer *Sargasso* (of which we gave particulars in our September issue, page 58), built by Messrs. John Readhead & Sons, West Docks, South Shields, to the order of Messrs. Scrutton, Sons & Co., London, for their "Direct" line, proceeded to sea on her official trial trip, which was in every way satisfactory to all concerned. The vessel afterwards left for Cardiff under the command of Captain Norris.

Norburn.—On October 17th, the steel screw steamer *Norburn* (of which we gave particulars in our September issue, page 59), built by Messrs. Craig, Taylor & Co., Ltd., Stockton-on-Tees, to the order of W. H. Loveridge, Esq., West Hartlepool, for the Norburn Steamship Co., Ltd. (Messrs. Smith, Hogg & Co., West Hartlepool, managers), was taken to sea for her trial trip, which proved highly satisfactory. During the whole of the trial everything worked with the greatest smoothness, and on a course of six miles a speed of 10½ knots was easily maintained, the vessel being fully loaded. She has been built under the superintendence of Donald Ross, Esq., West Hartlepool. Mr. Hogg (one of the managing owners) and Mr. Ross were on board the vessel, and both these gentlemen expressed themselves as being highly pleased with the ship and engines. After the trial the vessel at once proceeded on her voyage to Savona under command of Captain J. P. Sharp. The vessel is supplied with a Cochran (Annan) donkey boiler with patent seamless furance.

Tainui.—On October 17th, the new twin-screw steamer *Tainui* left Belfast Harbour and proceeded down Belfast Lough to Carrick Roads, where the operation of adjusting her compasses was carried out, the vessel afterwards having a series of runs on the measured mile course. The *Tainui* (of which we gave particulars in our October issue, page 93) has been designed and constructed by Messrs. Workman, Clark & Co., Ltd., Belfast, for the well-known and enterprising organization of Messrs. Shaw, Savill & Albion Co., Ltd., and is a valuable addition to their already extensive and efficient fleet. The story of this firm's operations takes us back to nearly half a century to the days of the famous British sailing clippers under the control of the Shaw, Savill Co. The Albion Co was also an old firm in the trade, and about a quarter of a century ago these two well-established houses decided to combine their interests, and inaugurated a regular fortnightly service of cargo and passenger steamers between London and New Zealand ports. The wisdom of this decision is proved by the success which has attended their efforts and by the expansion of their trade and consequent frequent additions to their fleet, which now includes some of the handsomest and most luxuriously appointed vessels in the British merchant service. All the steamers of the line are built specially for the company, being expressly designed for the New Zealand trade and are fitted up for the carriage of frozen meat, in which trade the Shaw, Savill & Albion Company were the pioneers, some of their earlier sailing ships being fitted with the necessary refrigerating machinery. The owners were represented by Captain McKirdy, R.M.E., and Mr. George Adams, who have supervised the construction of the hull and machinery. The results of the trial trip were of the most satisfactory character, and the vessel afterwards left for Cardiff, where she will load bunker coal, afterwards proceeding to London to take on board passengers and load cargo for her maiden voyage. Messrs. S. T. Taylor & Sons have covered six boiler bottoms of this vessel with their Tynos patent removable asbestos mattresses.

Theseus.—The extensive fleet of vessels trading under the flag of the Ocean Steamship Co., Ltd., of Liverpool, has been recently augmented by the addition of two large steamers built to their order by Messrs. Workman, Clark & Co., Ltd., of Belfast. The first of these steamers, the *Perseus*, was completed and handed over to her owners a couple of months ago, and on October 22nd the second vessel, the *Theseus*, (of which we gave particulars in our October issue, page 93), left the builders' wharf early for the Carrick Roads to undergo her speed trials and auxiliary machinery tests. The results of the trial runs and other manœuvres were of the most satisfactory character, and the vessel afterwards left the Lough for Bristol Channel, where she will take in cargo for her maiden trip to China and Japan.

Guarany.—On September 26th, the new paddle steamer *Guarany* (of which we gave particulars in our September issue, page 62), built by Messrs. A. & J. Inglis, Ltd., Pointhouse, for Señor Nicolás Mihanovich, Buenos Ayres, ran trials in the Gareloch. The trials were successful in every respect, the machinery working smoothly, and the speed attained was considerably in excess of that required.

REVIEW.

Amérique et Japon, par John Spartali, avec un préface par Vice-Amiral A. Bienaime. Paris, Le Yacht. 1908. Prix 8 francs 50 centimes.

THE author has adopted a somewhat wide title for his work, but it is really so exhaustive that a better description could hardly have been devised. Realizing that there are, and must be, many points of contact between the two great Powers whose shores are washed by the waters of the Pacific Ocean, and knowing that amongst nations there is always a liability to friction where interests clash, Monsieur Spartali has traced the development of the two countries, and especially of their navies, down t the present day, with a view of enabling the reader to a eciate the causes of the strained relations which a short while ago were so much in evidence between them, and to give him full data for gauging the relative strength of the two possible opponents. He traces briefly, but thoroughly, the settlement of the United States, with its population derived from so many European sources, yet as soon as it is landed on American soil merged into one apparently homogeneous people. He shows how this vast area—which is of no less than four times the extent of France—is being peopled and how, whilst it still has a population by no means large in comparison with the land available within its own borders, has set itself up as a colonial power. A good deal of space is naturally devoted to the history of the recent conflict between the States and Spain. For that episode caused the American people to develop their colonial and naval policies with increased vigour. Similarly he treats of the opening up of Japan, her extraordinary commercial and maritime progress, and her successful encounters with the neighbouring nations of China and Russia. Then he considers the points of difference between the two nations. In the second part of the volume an exhaustive resumé of the strength of the two navies is afforded to the reader. The fleets are shown in tabular form, the actual units are described with minute particularity, all the more important ships being represented not only by photographs, but also by diagrams. We do not believe that there will be serious trouble between the two powers. But if there were any chance of hostilities, the book would be an invaluable handbook to the onlooker, whilst even as things are—and as we trust they may continue—the survey of the position between these two powerful and virile neighbours is eminently interesting and instructive.

GLASGOW TECHNICAL COLLEGE MAGAZINE.—The first number of this magazine has just been published, as another element in that wonderful progress, which has marked the College within the past few years, since His Majesty King Edward laid the foundation-stone of the new buildings in 1903; and the lordly pile erected well sustains the honour conferred upon it at its inception. A few seasonable editorial notes are followed by an eulogium of this "temple of knowledge," relieved, in humorous vein, from any tendency to cloy. An exhortation is addressed to the students to foster that feeling of *esprit de corps*, which, so essential to the well-being of any community, it is one of the chief objects of the magazine to promote. A few paragraphs are devoted to the scientific, civil engineering, dialectic, architectural, chemical and naturalistic societies, which are conducted on similar lines to the higher institutions in the technical world; and besides helping to keep the older members in touch with the College, provide opportunities for friendly discussion on technical subjects, and prepare the way to higher platforms and broader arenas. The ceremony of the presentation of the diplomas to the associates of the past session is described, and references are made to the speeches of Dr. Beilby, Professor Gibson, Principal MacAlister, and Mr. J. Ward, with their several expressions of the close relationship between technical science and the industrial world, between professor and student, during and after college life, between the College and the University, and between the College and the manufacturer in the training of apprentices. The heavier reading matter is widely interspersed with quaint and humorous productions of the art of the rhymster and the illustrator, and with those odd snatches of wit and fun which the irrepressible levity of student days extracts from the driest and most abstruse of subjects, by which the tense drawn mind must seize relaxation in lighter vein. That the magazine is a credit to the public-spirited men, who have laboured so well to make it a success, is to say the least in praise of their efforts; and it must and will, deserve and gain the support of all those who have, or have ever had, any connection with the College, as well as many to whom that privilege is not yet.

BOARD OF TRADE EXAMINATIONS.

NOTE—1C denotes First Class; 2C Second Class.

September 19th, 1908.

Anderson, A. M.	2C	Glasgow
Avern, Francis	1C	South'ton
Baker, C. T. D.	2C	N. Shields
Barrett, T. W	2C	Cardiff
Bell, James M.	2C	W[illegible]
Bennie, Wm. ..	1[illegible]	
Brayton, G. E	[illegible]	
Brewis, C[illegible]		
Br[illegible]		
[illegible]		
Coward, W.	[illegible]	
Cowling, W[illegible]	[illegible]	Cardiff
Davis, Percy ..	1C	Cardiff
Douglas, Jas. ..	2C	W. Hart'l
Durbrw, Wm.	1C	South'ton
Edwards, Edw.	2C	Liverpool
Elliott, Hy. C.	1C	W. Hart'l
Farrer, Jas. H.	2C	N. Shields
Fenwick, P. A.	1C	W. Hart'l
Franklin, R. ..	2C	Liverpool
Gatland, A. L.	2C	London
Gibson, Alf. T.	2C	Cardiff
Ginnettey, P. P.	1C	Liverpool
Gordon, John F.	1C	Glasgow
Graham, R. H.	1C	W. Hart'l
Graham, Wm	1C	Glasgow
Groom, Chas. B.	2C	Liverpool
Groundwater, H	1C	Liverpool
Hammond, H.	1C	South'ton
H[illegible] W. T	2C	London
Henderson, J. D.	2C	Glasgow
Huntley, E. E.	2C	W. Hart'l
Jones, Frank T.	2C	Liverpool
Lidington, H. R.	1C	Glasgow
[illegible] James ..	1C	N Shields
[illegible]ald, J. L.	2C	W. Hart'
[illegible], Wm ..	2C	Glasgow
[illegible]ns, A. P.	1C	London
[illegible]son, H.	2C	Leith
[illegible]ald, A...	1C	Barrow
[illegible]onald, J. B.	1C	Leith
[illegible]ougall, A. A.	2C	Glasgow
[illegible]sor, B. G...	2C	W. Hart'l
[illegible] Gillies, Thos.	2C	Glasgow
[illegible]Gregor, Robt	1C	Glasgow
Mitchell, Frank	1C	Cardiff
M'Leod, John..	1C	Glasgow
M'Neil, Frank	1C	Cardiff
Moon, Reg. J.	1C	Cardiff
Munro, William	2C	Glasgow
Nicholas, W. H.	2C	London
Parry, Fredk. J.	2C	Liverpool
Paton, James ..	1C	Leith
Pearson, Harry	2C	W. Hart'l
Playfair, John C.	2C	Glasgow
Rames, H. S. ..	1C	Barrow
Rowlands, E. J.	2C	Liverpool
Salter, James ..	2C	Liverpool
Sawle, Chas. F.	2C	Plymouth
Scott Alexander	1C	London
Seagrave, Wm.	1C	W. Hart'l
Stam, A. H. D.	1C	London
Winder, F. J...	2C	Cardiff
Wylie, Alex B.	1C	Liverpool

September 26th.

Alexander, Wm.	1C	Greenock
Bain, William..	1C	Aberdeen
Beaton, John D.	2C	Aberdeen
Blellock, Robert	1C	London
Bothwell, Alex.	2C	Aberdeen
Bragg, Percy ..	2C	Bristol
Brown, R. K. ..	1C	Greenock
Call-Weddell, C.	2C	Sunderl'd
Core, James....	2C	Dover
Cowell, Willie..	2C	Aberdeen
Crabtree, R. B.	1C	Liverpool
Cross, James ..	2C	Liverpool
Daniels, L. S. ..	1C	N. Shields
Davidson, Thos.	2C	Liverpool
Duncan, Wilfrid	2C	Aberdeen
Fanning, F. E	1C	Sunderl'd
Ferries, Jas. D.	2C	Aberdeen
Ford, Martin ..	2C	Aberdeen
Gray, Thomas ..	1C	N. Shields
Harrison, H. ..	2C	N. Shields
Imray, Wm. N.	1C	London
Jones, John A...	2C	Bristol
King, R. F.....	2C	Sunderl'd
Knowles, John	2C	Sunderl'd
Leaity, Wm. F.	2C	London
M'Adam, A. ..	2C	Greenock
Mann, David ..	2C	Aberdeen
M'Cullum, L. H.	2C	Greenock
McIndoe, A. J.	2C	Greenock
M'Intyre, Wm.	2C	Hull
Norrie, Wm. C.	1C	Aberdeen
Parker, John S.	2C	Liverpool
Paterson, J. M.	2C	Greenock
Patterson, J. H.	1C	Aberdeen
Peterson, J. W.	2C	Hull
Ray, Wm. H...	2C	Liverpool
Robinson, J. W.	1C	Liverpool
Sangster, Alex.	1C	Aberdeen
Sowter, R. L...	2C	London
Stabelford, Wm.	1C	N Shields
Sutton, W. L...	2C	Liverpool
Swanson, G. D.	1C	Hull
Taylor, John ..	1C	Liverpool
Thomas, John..	1C	Sunderl'd
Thorpe, Evelyn	2C	Hull
Walker M.	2C	N. Shields
Welcome, E. W.	2C	Hull
Yeaman, R. D	2C	N. Shields

October 3rd.

Aiken, William	2C	N. Shields
Allan, William	1C	N. Shields
Allison, R. R...	2C	Glasgow
Barr, David L.	1C	Glasgow
Barrow, R. S. R	1C	London
Brawley, John	2C	Cardiff
Brown, A.	1C	South'ton
Browne, A. C.	1C	London
Burgess, P. E.	1C	N Shields
Calder, John H.	2C	London
Campbell, W C	2C	Glasgow
Chandler, H. C.	1C	Leith
Clark, R. M. K.	2C	Glasgow
Davies, N. S. ..	1C	London
Eves, Henry E.	1C	London
Ferguson, J. J.	2C	Glasgow
Frame, William	2C	Glasgow
Frederick, W. J.	2C	Cardiff
Gibb. Thos.....	2C	Leith
Gillman, C. H.	2C	London
Hamilton, B. ..	1C	N. Shields
Iliff, Geo... ...	2C	N. Shields
Inglis, Peter ..	1C	Glasgow
Irwin, Roy	2C	N. Shields
Jones, Lewis M.	2C	Liverpool
Lang, G. H. D.	2C	London
Laws, Henry A.	2C	South'ton
Lawson, D. A.	1C	Liverpool
Michael, H.....	2C	Liverpool
M'Kinnon, H...	1C	Glasgow
M'Kinnon, Jas.	2C	London
M'Lintock, P...	2C	Glasgow
Morrison, Alex.	1C	London
M'Queen, Alex.	1C	Glasgow
Nicol, Geo. L...	1C	Glasgow
Parry, Robert..	1C	N. Shields
Pittman, W. J.	1C	London
Powell, E. D...	1C	London
Ramsay, F. L.	2C	Liverpool
Roberts, W. ..	1C	London
Rodger, Jas. ..	1C	Glasgow
Rowe, H. P. ..	2C	Cardiff
Shimmin, T. S	1C	Liverpool
Stewart, D. M. F.	2C	Leith
Sullivan, Wm.	2C	N. Shields
Taylor, Chas. A	1C	South'ton
Thomas, J. W.	2C	N. Shields
Thomson, W...	2C	N. Shields
Wade, C. A. ..	2C	Liverpool
Walkinshaw, G.	1C	Leith
Walton, Edwin	2C	Cardiff
Wheatley, W. H. N.	1C	London
White, Jas.	2C	South'ton
Whyte, Thos. ..	1C	South'ton
Whyte, Jas.	1C	London
Woodcock, C. V.	1C	Liverpool
Young, J. W. ..	1C	Liverpool

October 10th.

Burton, Fred	2C	N. Shields
Carbines, W. B.	1C	Liverpool
Colman, Edwin	2C	N. Shields
Dabron, Wm. J.	1C	London
Fowler, J. G. P.	2C	N. Shields
Fisher, J. A	1C	N. Shields
Hamilton, J. H.	1C	N. Shields
Hedworth, C. W.	1C	N. Shields
Hewitt, A. H.	2C	Liverpool
Iffla, Alexander	1C	Liverpool
Kipps, Hy.	2C	Liverpool
Low, Jas. W.	1C	N. Shields
Marr, Andrew	1C	London
Morrow, Wm. T.	2C	Liverpool
Naylor, N. W.	1C	London
Peate, E. B. T.	1C	Liverpool
Reynolds, F. H.	1C	London
Richardson, R.	2C	N. Shields
Schmidt, H. E.	2C	Liverpool
Smart, David	1C	N. Shields
Sutherland, A. J.	1C	London
Tomkins, A. R.	2C	N. Shields
Weir, John	2C	Liverpool
Wilvers, J. E. J.	1C	London

October 17th.

Adams, Joseph	2C	N. Shields
Agerskow, E. G.	1C	Hull
Craig, Wm	2C	Greenock
Dalrymple, F. S.	1C	London
Dick, James ..	1C	Greenock
Ferguson, Thos.	1C	Liverpool
Godfrey, R. G.	2C	London
Hagan, J. L. ..	2C	N. Shields
Hannah, W. A.	2C	Liverpool
Hartley, A. G.	1C	Hull
Hay, John R...	2C	Liverpool
Hills, Wm. P.	2C	N. Shields
Hodgson, P. B.	2C	Hull
Holm, J. H. H.	2C	London
Hudgell, A. V.	2C	London
Jessop, G. F. A.	2C	N. Shields
Kerr, George A	2C	Greenock
Kerr, John D.	2C	Greenock
Kirkwood, P. T.	2C	Liverpool
Manning, T. G.	2C	Hull
Maulkinson, R.	2C	Liverpool
Maybank, Alfred	1C	London
Mayne, R. E. ..	1C	London
McKenzie, M...	1C	N. Shields
Miller, D. W...	2C	London
Morgan, J. G...	2C	Greenock
Paget, Wm. ..	1C	N. Shields
Parkes, John G.	2C	N. Shields
Prescott, W. C.	1C	London
Simpson, D. ..	2C	Dundee
Smith, Wm. ..	1C	Dundee
Smith, Jas.	2C	Liverpool
Thompson, J. ..	1C	N. Shields
Todd, Jas.	1C	Greenock
Waite, Fred ..	2C	Liverpool

The Marine Engineer

And Naval Architect.

LONDON, DECEMBER 1, 1908.

NORTH-EAST COAST INSTITUTION OF ENGINEERS AND SHIPBUILDERS

THE addresses given by the Presidents of our scientific institutions on entering their period of office are always interesting, not only to the scientific world, but to all those who study economics, and the presidental address of Mr. Summers Hunter, delivered before the North-East Coast Institution of Engineers and Shipbuilders on November 6th, is no exception to the above. He did not deal so much with the past as with the present and future, and showed most conclusively the usefulness of the Institution and the important educational bearing it has on the leading industries of the district and the influence it has on matters of imperial import. It will be conceded that what was once the property of the individual in the form of technical knowledge is now within the reach of all, particularly those who are members of a scientific institution, owing to the unstinted gift of information in papers and discussions by those whose knowledge has been the result of experimental research and practical experience. One important effect of this free interchange of experience has been the creation and fostering of a strong feeling of good-fellowship between the leaders of our great industries, resulting in the successful working of very large concerns in which individual effort and enterprise are by no means lost, and its recognition as an important factor in a wholly successful undertaking. Mr. Hunter, while fully realizing the advantages offered to-day to young men in the way of technical colleges, scholarships and graduateship of a scientific institution, is quite alive to the responsibility of employers in supporting and fostering these methods and in encouraging and rewarding true merit. In these days, when complaints are made that every profession is overcrowded, and the cry goes up so often, "What are we to do with our boys?" it is refreshing to hear from such an authority as Mr. Hunter that there never was a time when there was a greater demand and a better future for young men of sound training and ability, and that although competition is keen it is necessary, as without it there would be little or no life or progress in our work. It may be that the line of development involves the specialization of individuals, but no harm will arise from this so long as individuality is not crushed out of existence. We desire to lay special emphasis on this feature as a national question, for it is very largely owing to this characteristic that the British nation has attained its present position among the nations of the world. A more than passing reference is made to the Chair of Naval Architecture at Armstrong College under Professor Welch, and at this moment no less than thirty day students are taking this Naval Architecture course, many of them with a view of taking their B.Sc. degree. This course has been much enhanced in value by the presentation of scholarships by the Committee of Lloyd's Register and the Worshipful Company of Shipwrights. It is difficult to imagine any more useful result from such advantages than the enhancement of the prestige of the North-East Coast and the prominence of local builders in connection with the Imperial and mercantile navies of the world.

We note with great satisfaction the remarks of Mr. Hunter in relation to the subject we dealt with in our last issue, the position of the engineering branch of the British Navy. While agreeing that it is not the province of the institutions to deal with political and strategical necessities, Mr. Hunter thinks it is the duty of the engineering institutions of the country to voice professional opinion, to point out what they believe to be grave defects in the engineering branch, and to criticise Admiralty policy when they believe it to be mistaken and fraught with danger to efficiency. The President holds that our first consideration is efficiency, and this efficiency has been reduced by the fact that the engineering branch is now classified by regulation as distinct from the military branch, thus placing the officers in a position of inferiority. That the duties of these officers are of a combatant nature has at least been recognised by the Admiralty, by their decision that engineers under the new scheme, and who are now mere boys, are to be military officers; and rightly so, as they are an indispensable part of a fighting organization, and as such should have a recognised military status and internal control of their compartments. Midshipmen of the new entry are already serving in the engine rooms of several ships, under orders of engineer officers, so that a difficult position has been already created, the gravity of which will increase the longer it remains untouched. The menace to discipline is a positive danger, which can only be removed by adequate recognition of the engineering branch as an essential part of the military branch of the service, with this important restriction, however, that engineer officers should never command ships, but should be eligible for any administrative position that can be held by those officers of the new scheme who devote themselves to purely engineering duties. These views will, we feel sure, be endorsed by the engineering branch as a whole, and it is our earnest hope that the Board of Admiralty will give them due consideration and vary their policy before such a condition of things is created, the result of which one dreads to contemplate. We think the nation owes a debt of gratitude to Mr. Hunter for

putting forward his views on a matter of national importance in such a responsible manner.

PRESIDENTIAL ADDRESS.

THE address delivered by the President of the Liverpool Engineering Society was full of interesting and valuable material, and a study of the impressive points touched upon by him will certainly add to the ever-enlarging education of the marine engineer, whilst it ought undoubtedly to bring about an improvement in the means used in transporting and in storing refrigerated produce on land. This latter point was specially referred to at the Paris Congress, so that we may infer there is room for improvement both in this country and elsewhere. The question arises as to the constituted authority to whom an appeal can be addressed with a view to an improvement being made. It has been suggested that the inspection of produce should not terminate at the landing-stage, but be continued until it reaches the market. While this would be difficult to carry into entire effect, due to the conditions of storage and the uncertainties of the market, it is quite evident that some improvements are necessary.

THE "OTAKI"

IT is with pleasure we note the report of the trials of the new steamer for the New Zealand Shipping Co., to whose enterprise, on the inception of the builders, is due the introduction to the mercantile marine of the combined reciprocating and turbine machinery for steamship propulsion. The builders' trials and the official trials appear to have given results which are satisfactory both to the contractors and the owner, and the higher speed attained over the sister vessel with the same boiler dimensions may be taken to indicate a gain in efficiency. The important results, from the owners' point of view, remain in the hands of the engineers, conjointly with the commander on the bridge in directing the courses to work out during the voyage, in the regulation of speed to maintain the dates of arrival from port to port, with decreasing consumption of coal and consumable stores.

S. T. TAYLOR & SONS covered boilers, pipes, etc., of the steamships *Fangturn, Yeddo and L'Aude* with their Tynos non-resisting material.

HEENAN & FROUDE, LTD.—We have received a copy of a new catalogue of blast and exhaust fans, built on the "Heenan and Schiele" patent issued by Messrs. Heenan & Froude, Ltd., of Worcester Engineering Works, Worcester. The illustrations given in the catalogue include fans for blowing smiths' fires, cupolas and furnaces, forcing air into mines, shafts, tunnels and walls, sinking and heading out, drying wood, yarn, textile fabrics and grain, and fans for exhausting smoke from smiths' fires, dust from grinding rooms, fumes and noxious vapours from chemical works, foul air and gases from sewers, tunnels, pit shafts and mines and dust from carpet-beating machines.

SOME OBSERVATIONS ON SURFACE CONDENSING PLANT, WITH SPECIAL REFERENCE TO RECENT DEVELOPMENTS.*

By Mr. ROBERT BRUCE, M.I. Mech. E., M.I. Mar. E.

1769. *James Watt.* The specification of the patent (No. 913), granted on January 5th, 1769, to the illustrious James Watt contains the following sentence :—

"In those engines that are to be worked wholly or "partially by condensation of steam, the steam is to be "condensed in vessels distinct from the cylinders, though "occasionally communicating with them. These vessels "I call condensers, and whilst the engines are working they "ought to be kept as cool as the air in the neighbourhood "by the application of water or other cold bodies."

These words constitute the first description of "separate" condensation, and while it is an historical fact that no drawing was annexed to this great specification, we know that Watt's earliest experimental model embodied a condenser consisting of two small sheet-metal pipes each about 12 inches long, connected at their upper ends with the steam cylinder, and at their lower ends with a simple suction pump, the tubes and pump being immersed in a vessel of cold water. Fragments of this experimental apparatus still exist to remind us that the inventor of the "Separate" Condenser produced also what is now known as the "Surface" Condenser.

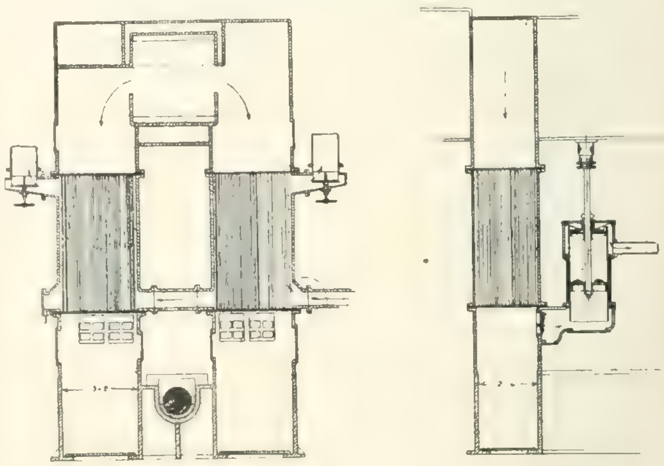


Fig. 1.

We need not pause to enquire why Watt proceeded from the "surface" to the "jet" condenser, such a discussion being beyond the scope of the present paper. Suffice it to say that his engines were invariably fitted with jet condensers, a type of apparatus which obtained almost universally from the earliest days of the steam engine down to the middle of the last century.

1831. *Samuel Hall.* In its commercially successful form, the Surface Condenser first appeared in 1831, the inventor being Samuel Hall, a cotton manufacturer, of Basford, in the county of Nottingham. The specification of Hall's patent (No. 6204 of 1831, King William the Fourth) contains the following description :—

"My improved method of condensing steam and supplying water to the boilers as aforesaid, so far as relates to the supplying of the water to the boilers, consists in effecting the repetition of the following routine of water and steam through the steam engine. The water with which the boilers are in the first instance supplied, having issued from them in the form of steam, passes through the working cylinder and is then

* Read before the Institute of Marine Engineers, on November 16th, 1908. W. Lawrie, Esq., Chairman of Council, in the chair.

reconverted (by the condensing process before described) into water, in which state it proceeds through the refrigerator, air pump, and separators, when being separated by the latter from the oil or other lubricating matter, it is again supplied to the boilers." In a further passage, Hall describes his method of condensing steam as consisting " of an improved mode of using a system of metallic surfaces, which may be composed of vessels, channels, passages, or pipes, of any convenient form and arrangement for condensing the steam and cooling the water, resulting therefrom on its passage from the condenser to the air pump." The specification of Hall's second patent (6359 of 1833) describes circulation of the water through the " cistern " containing the tubes, the inventor stating that he finds it best " to let the cold water enter the cistern at the top of the end thereof which is nearest to the air pump, and escape at the bottom of the other end next to the working cylinder." In Hall's condenser, the steam passed *through* the tubes, the cooling water flowing round about them, otherwise, the apparatus of 1831 is identical, so far as general construction goes, with the majority of modern surface condensers.

No section of the engineering profession can be better aware of the great importance of Samuel Hall's apparatus than the members of this Institute, and I appreciate this opportunity of referring to the work of one, who, while leaving posterity his debtor, died in comparative poverty, after spending a fortune on the invention with which his name will ever be associated.

through the tubes to the air pump suction, a separate air pump being provided for each condenser. The cooling water was propelled upwards through the condensers by a centrifugal pump, valves being provided at the circulating outlet branches so as to equalize the weight of water flowing through each condenser.

The total condensing surface provided in the *Mooltan* amounted to 4200 square feet, and as the engines indicated 1,734 H.P. on the official trial, the surface allowed was at the rate of rather less than 2½ square feet per I.H.P. It affords an interesting indication of early progress when we reflect that in 1837, the condensing surface provided in the *Wilberforce* amounted to as much as 7½ square feet per I.H.P.

The success of the *Mooltan* undoubtedly went very far to establish permanently the use of surface condensers at sea, and it will be freely conceded that without some such apparatus steam navigation on its present immense scale would have been utterly impossible.

Pioneer Work.—While it is not attempted in the present paper to chronicle at length the history of condenser development, brief reference may be made to the work of certain pioneers in this branch of steam engineering. Among these, particular mention should be made of Mr. Francis Humphrys, who designed and built at Dartford the original machinery of the *Wilberforce*. Later, his brother, Mr. Edward Humphrys, of Deptford, designed and constructed the engines of the *Mooltan*, which have already been referred to. Another marine engineer prominent in connection with surface condenser development was Mr. J. F. Spencer, of Brighton, who did much to introduce the preferable, and now invariable, practice of passing the cooling water through the tubes instead of round about them. Coming nearer our own time, all engineers are familiar with the work of Mr. James Weir, who was not only an early investigator, but the originator of modern feed heating and boiler feeding methods.

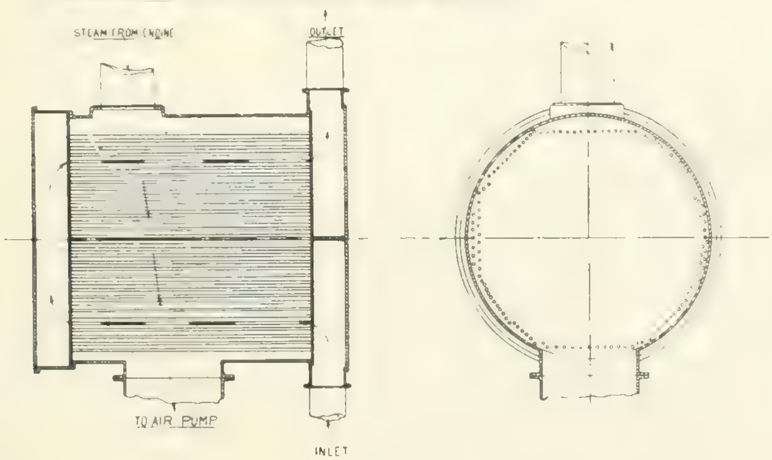


Fig. 2

The " Wilberforce." The history of surface condensation at sea may be said to commence in 1837 with the installation of Hall's condenser on the paddle-wheel steamer *Wilberforce*, employed between London and Hull. The indicator cards taken from the engines of the vessel show that so far as *vacuum* goes, no better figures are obtained to-day, notwithstanding which the condensers were removed after working for four years, and ordinary injection substituted. The apparent failure of the *Wilberforce* was doubtless due to the fouling of the tube surfaces by mud from the Thames and Humber, rather than to any inherent defects in the apparatus, though the condenser tubes in those days were of uncertain quality, and may possibly have caused trouble in this instance.

The P. & O. s.s. Mooltan.—After the *Wilberforce*, we find a number of more or less isolated examples of surface condensers applied to marine engines, but the actual inauguration of surface condensation as standard marine practice dates from the equipment of the P. & O. steamship *Mooltan*, which in 1859 was fitted with surface condensers almost exactly on the lines which had been laid down by Samuel Hall, twenty-eight years previously.*

The general arrangement of the condensers and air pumps of the *Mooltan* is clearly shown in the illustration (Fig. 1), from which it will be seen that the steam passed downwards

Generally speaking, however, surface condenser design has remained, until within the last few years, almost exactly as it was in 1859, the vast majority of present-day marine condensers differing in no essential from those of half a century ago.

The condenser illustrated (Fig. 2), will be recognised as representing the practice even of our own day, though actually it was designed and built for the White Star Line by Messrs. Maudslay, Sons, & Field, some thirty years ago.

The Parsons Turbine.—In tracing the developments which have taken place recently in connection with surface condensing plant, it is hardly necessary to point out that the efforts made in this direction have largely originated in the requirements imposed by steam turbines. As soon as it was recognised by Engineers and the public that Mr. Parsons' great invention was no mere technical hobby, it became apparent that the efficiency of the new prime mover was influenced by the exhaust pressure to a much greater extent than in the case of reciprocating machinery. With the turbine, the efficiency increment due to diminishing exhaust

* Humphrys on " Surface Condensation in Marine Engines," Proc. I., Mech. E. 1862.

pressure demands the production of the highest possible vacuum, so that the rapid supersession of the reciprocating engine by the turbine has been associated with a wide recognition of the prime importance of vacuum-producing plant. Up to the present, the use of the new prime mover at sea has been largely confined to warships and fast passenger steamers, but all marine engineers are becoming familiar with the outstanding characteristics of the steam turbine and the particular conditions under which it should be operated.

While the attainment of high vacuum is obviously a matter of supreme economic importance where turbine machinery is used, it is equally certain that no gain in fuel economy results from diminishing the exhaust pressure of reciprocating engines below a certain point. Nevertheless, any improvements in the efficiency of vacuum-producing plant are bound to interest those responsible for the best performance of reciprocating engines, and it is to such that the present paper is specially addressed.

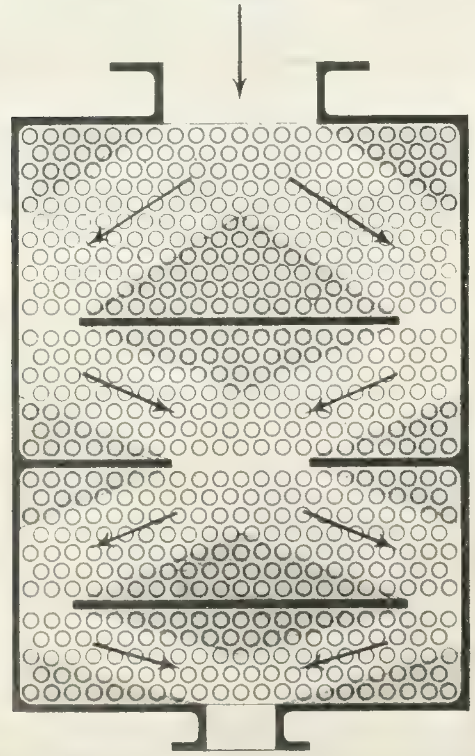


Fig. 3

Weighton's Experiments.—Those engineers who have followed the trend of surface condenser design will associate much of the recent revival of interest in the subject with the paper read by Professor Weighton at the 1906 Spring Meetings of the Institution of Naval Architects. This communication is well worthy of careful study, especially as the developments later referred to are in considerable measure its practical outcome. Briefly, Professor Weighton's paper contained an account of some exhaustive experiments made on surface condensers with the object of ascertaining the extent to which efficiency could be influenced by design. One of the condensers tested was of the ordinary standard type, the others embodied certain departures from established practice, devised by Mr. D. B. Morison of Hartlepool, with a view to improved efficiency. As is invariably the case, Professor Weighton's experiments suggested new and important lines for future research, but they were specially instrumental in establishing the value of certain modifications, which make up what has been called the "Contraflo" system of surface condensation.

The Contraflo Condenser.—In dealing with the evolution of Contraflo condensing plant, there is no need to remind engineers that the surface condenser to which we have hitherto been accustomed consists simply of a chamber filled with cooling tubes, the exhaust steam passing amongst these elements on its way from the cylinder to the air pump suction. Now the first defect of this arrangement is easily detected, since it must be obvious that any steam which enters the condenser tends to short-circuit direct to the air suction, thus leaving a portion of the nominal condensing surface partially inoperative. It can be readily seen that with such condensers the tendency to short circuit leads to a partial and imperfect distribution of steam over the surface, so that the amount of steam condensed per unit of total surface provided, must, with a given load and under given conditions, be comparatively low.

It is evident that in order to promote surface efficiency, this short-circuiting tendency ought to be eliminated, provided no counterbalancing disadvantage be thereby entailed. Hall, as we have seen, endeavoured long ago to improve

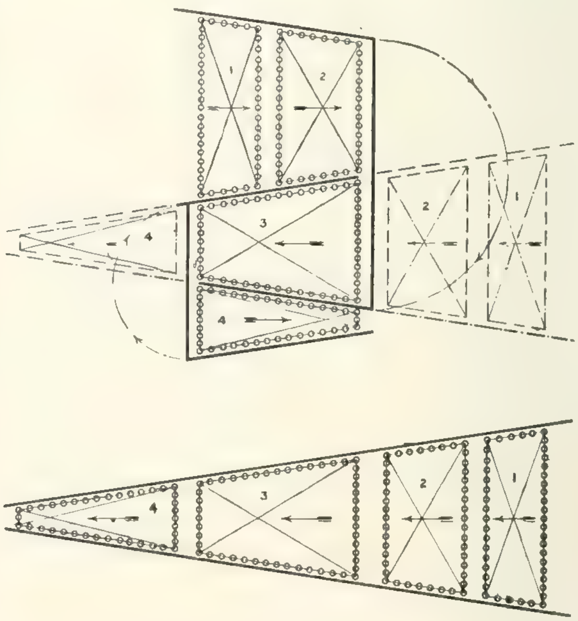


Fig. 4.

surface efficiency by compelling the water to flow in a devious stream over the condensing tubes; later investigators have dealt similarly with the steam, and this brings us directly to a consideration of the various methods whereby circulation on the steam side may be effected. The first requirement in this connection is to devise means whereby uniform and pervasive steam flow takes place throughout the entire condenser section and over the whole condensing surface.

Fig. 3 illustrates diagrammatically the futility of mere "baffles" used to secure circulation of the steam, it being evident that the vapour will tend to follow the unshaded paths from entrance to exit, short-circuiting the tubes in shaded areas, and thus rendering a considerable portion of the surface ineffective.

With condensers of the Contraflo type, uniformity of flow throughout the section and over the surface is secured by dividing the apparatus into a number of successive compartments, proportioning the condenser so that between the steam inlet and the air pump suction the vapour traverses a relatively long course, and is distributed evenly over each tube length, and at right-angles both to the condensing elements and the falling water of condensation. Fig. 4 shows graphically the basis principle upon which the Contraflo construction is founded, the cylindrical development of the design being illustrated in Fig. 5.

"*Counter Current*" *and* "*Contraflo*."—In Counter Current condensers—which are arranged to produce vapour flow parallel to the tube axes—it will be found that instead of impinging from surface to surface the vapour tends to follow definite stream lines, which, being in a linear direction and parallel with the condensing tubes, are not conducive to rapid heat transfer. The characteristic difference between this construction and the Contraflo arrangement can best be understood from the figure herewith (Fig. 6), which illustrates diagrammatically the linear distribution within a Counter Current condenser, and the serpentine or Contraflo alternative. It will be seen that in the first case the vapour flows as it were in cores between the tubes, the stream lines being parallel with the condensing elements. With the Contraflo, however, the vapour is made to flow sinuously over the tubes and at right-angles thereto, so that not only is the length of path relatively increased, but a definite impinging action obtains throughout. The technical advantage of this method lies obviously in its higher capacity for the transfer of heat, which tends under given conditions to diminish the condenser temperature, the interchange of heat being facilitated as much as possible by tube arrangement in relation to the flow of vapour.

largely to the improved results obtained from condensers designed in accordance with the Contraflo system.

Compartmental Drainage.—While the original experiments were directed specially towards a better utilization of the available condensing surface, it was seen that other important developments in design were possible, and might contribute still further to the realization of improved condenser performance.

Observations made on an experimental apparatus confirmed the supposition that a very large proportion of the total steam was condensed among the upper rows of tubes, the water formed being simply showered like tropical rain on to the lower and colder tube surfaces. Now the function of a surface condenser is to condense steam, and while the heat of vapourization must inevitably be rejected with the circulating water, it is obvious that any unnecessary cooling of the condensed steam-water will result in a direct thermal loss, which can only be made up by the application of an equivalent amount of heat at the furnaces.

It is therefore desirable to so arrange surface condensers that the steam-water may flow to the hot well as soon after deposition as possible, instead of being cooled unnecessarily by showering over the remaining tube surfaces. This undue

CYLINDRICAL TYPE OF CONTRAFLO CONDENSER

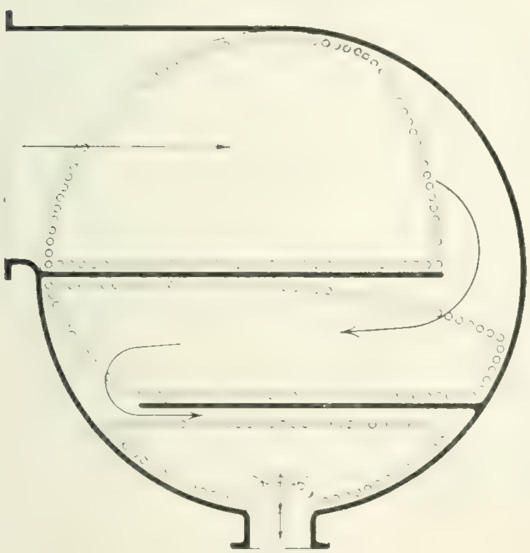


Fig. 5.

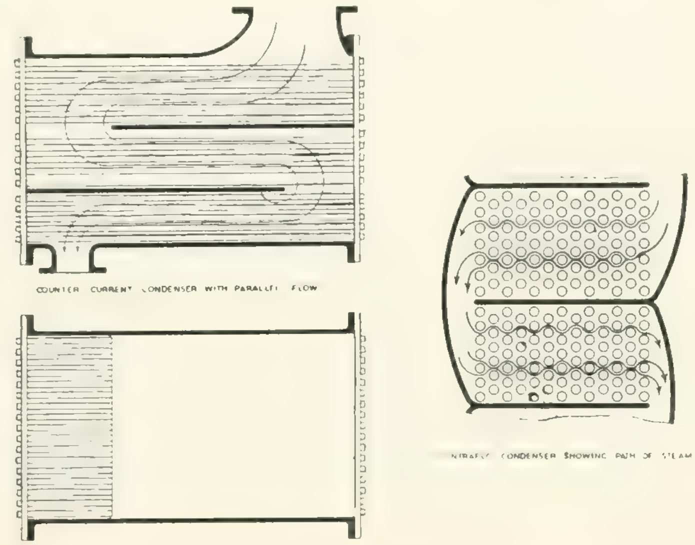


Fig. 6.

Reversal of Vapour Flow.—Though baffle plates were used in connection with surface condensers at least as far back as 1833, it is only during the last few years that their effects on performance have been adequately investigated. Clearly, the interposition of any deflecting plate in the steam path of a surface condenser involves either complete reversal or some change in the direction of flow, and these twistings and reversals take place, of course, within the condenser. Accordingly, if back pressure is to be avoided, it is necessary to so proportion and locate the reversing areas that at full load the steam velocity may not be unduly high.

With condensers in which the steam flow is parallel to the axes of the tubes, the passage for the steam will require to be so proportioned that short-circuiting is inevitable at low loads, while at all loads the reversal of steam flow necessarily takes place amongst the close pitched tubes. These effects will be clearly understood from an examination of Figs. 6 and 7. In the Contraflo condenser, however, the guide plates are used in association with reversal of the steam flow in passages which do not contain condensing tubes. In other words, any changes in the direction of flow take place in free spaces quite outside the tube nests, which afford not only unimpeded reversal, but act as distributing and equalizing compartments between the successive condensing sections. These "tubeless passages," as they are called, constitute a most important development in surface condenser design, and in association with other modifications, contribute very

and ever-present water-cooling tendency of the ordinary surface condenser is accompanied by an effect directly inimical to surface efficiency, in that the continuous showering action impedes condensation of the steam amongst the lower rows of tubes.

By utilizing a system of guide plates so as to form distinct condensing compartments, the water precipitated in each section may be separately drained off and the hotwell temperature made to approximate as closely as practical considerations will permit, to that corresponding with the mean condenser vacuum. Further, as the water formed in each compartment is prevented from showering down through succeeding sections, condensation amongst the lower tube surfaces is not hampered by the objectionable shower-flooding action due to water precipitated from above. The compartmental system is thus seen to improve surface as well as thermal efficiency, and its use in association with tubeless reversal passages constitutes an essential feature of all Contraflo condensers.

Effective Use of Circulating Water.—For obvious reasons, surface efficiency is invariably associated with a relative saving in the quantity of condensing water which must be pumped—other things equal—in order to maintain a given vacuum. If for example, the design of the condenser is such as to facilitate the retention of air, some of the surface will act inefficiently owing to air-drowning, and the maintenance under given conditions of any given vacuum wil'

necessitate an increase in the weight of water pumped. Again, if an unduly large proportion of the steam water is being continuously cooled by showering over the lower tube surfaces, then the sensible heat lost from the feed water

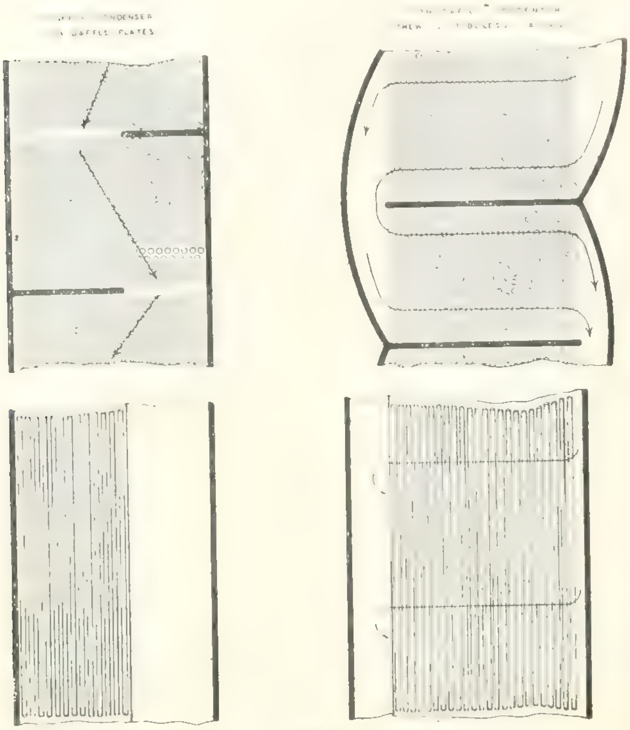


Fig. 7.

reappears in the shape of a rise in the temperature of the circulating water, an increment due, not to the condensation of steam, but to the unnecessary cooling of the feed.

It is instructive to remember that beyond a certain limit the effect of any increase in the weight of water pumped per unit of steam rapidly diminishes.

Years ago the Chief Engineer of the old *Mooltan* made the following simple experiment when crossing the Bay of Biscay. With the temperature of the sea at 70°F., the vacuum was found to be $26\frac{3}{4}$ in. in the condenser of the forward engine, and $26\frac{1}{2}$ in. in that of the after engine. The discharge valves of the condenser of the after engine were then closed so that the whole of the circulating water was made to flow through the other condenser, the result being that the vacuum in the forward condenser was raised to $27\frac{1}{8}$ in., an increase of only $\frac{3}{8}$ in. when the quantity of cooling water was practically doubled.

Later research has established closely the relation which should exist under given conditions between the quantity of water and the condenser vacuum, so that it is now comparatively easy to proportion condensing plant, and to analyse condenser performance on this basis.

On land, where circulating water may have to be purchased, economy in this connection becomes of the utmost importance, but at sea, the unlimited water supply tends to prevent the condenser receiving adequate attention, hence the comparative absence of progress towards high efficiency which has characterized marine condenser practice.

Air Extraction.—The function of the air pump is, of course, to so rarify the condensing and exhaust systems that the mean pressure therein may fall as nearly as possible to the pressure corresponding with the lowest temperature which the condenser proportions and conditions of working can maintain. In other words, any pressure within the condenser due to air must be minimised, in order that the highest vacuum possible for the condenser may be realized.

While the air and vapour have usually been removed by simple reciprocating pumps, steam and water jets have also been employed for the same purpose, such applications being based very largely on the principles enunciated about 1798 by the celebrated Venturi, and exemplified in the well-known jet pump developed many years ago by Professor James Thomson.

Piston air pumps are usually proportioned so as to provide a certain volumetric capacity per pound of steam condensed, this capacity depending on such considerations as the type of engine, normal air leakage, and vacuum required.

In view of the necessarily empirical basis of their design, and the fact that really high vacua are only obtained in association with comparative air tightness, no efficiency rating can properly apply to piston air pumps, the term "sufficient" being more appropriate than "efficient" as applied in connection with their performance.

Recent air pump research has, for obvious reasons, been coincident with the development of turbine machinery and the demand for low exhaust pressures. Piston pumps, while dealing adequately with air at the density permissible in the case of reciprocating engines, have been found to possess definite limitations when combined with turbine plant, hence the efforts made to increase their effect or replace them by something better.

It is well known that the air displacing capacity of any reciprocating air pump depends upon its temperature, a circumstance which explains why the piston air pump has limitations as an apparatus for maintaining very high vacua. Clearly, the capacity will vary with the pressure difference between the pump and the condenser, so that any so-called efficiency will, in the given conditions, be contingent upon the maintenance of a pressure ordinate between the condenser and the pump. In other words, the condenser vacuum suffers in order that the pump may be assisted. The explanation of this phenomenon is based, however, on physical and not on mechanical considerations, so that no matter how excellent may be the design or construction of any air pump, its value as an air extractor must be very minute when the condenser pressure approaches near to the absolute.

Considerations such as these have led to the evolution of apparatus devised with a view either of abolishing the reciprocating air pump altogether or of augmenting its effect.

To the first class belongs the Westinghouse-Leblanc system, whereby air is entrained by water laminæ thrown out by a rapidly revolving turbine wheel. To the second belong such devices as Mr. Parsons' Augmentor, and the Contraflo cooling systems. The Leblanc arrangement will not be gone into here since we are more particularly concerned with purely marine appliances.

Parsons' Augmentor.—The "Augmentor" as used in connection with turbine surface condensing plant is an air pump

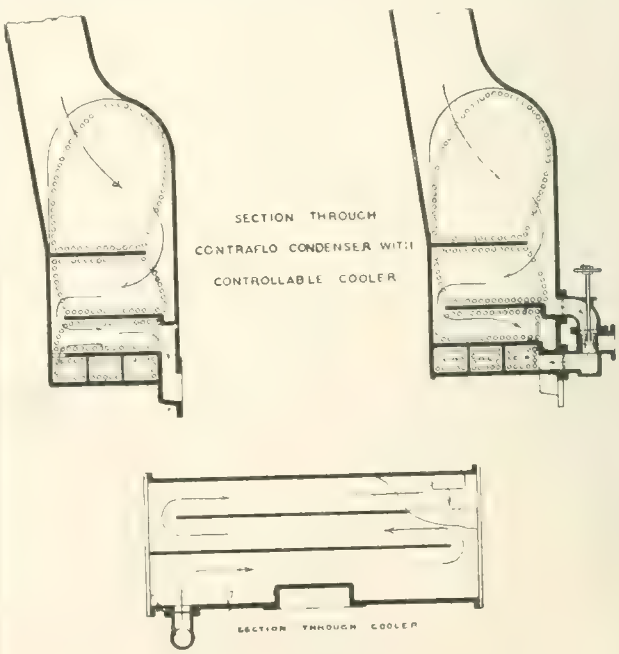


Fig. 8.

auxiliary, the lateral action of a steam jet drawing aerated vapour from the main condenser, and ejecting it into a small auxiliary surface condenser from which the air pump draws. The greatest effect of this apparatus may be said to begin just where that of the ordinary air pump ceases, the Augmentor being free from those latent mechanical limitations which at high vacua are inevitably associated with even the best air pumps.

While the " Augmentor " provides effective means whereby condensing surfaces may be freed from the detrimental presence of highly rarefied air, it involves a considerable expenditure of steam, the most of the heat in the jet going overboard with the circulating water. At maximum loads, this loss is more than compensated by the increased efficiency ratio of the turbine due to diminished exhaust pressure ; but at low loads the proportionate expenditure is often considerable, owing to the amount of steam required being approximately constant at all loads.

It is interesting in this connection to recall the brilliant invention by the late Alexander Morton of an arrangement whereby the air was extracted by the lateral action of exhaust steam, the steam, air and condensing water uniting in what Professor Rankine aptly termed an " Ejector-Condenser," no air pump at all being required. While the application of ejector-condensers is necessarily limited to land practice, it seems appropriate that mention should be made at this time of early successful attempts to utilize the principle of lateral action in the elimination of air.

Coolers.—We have seen that in his patent specification of 1831, Samuel Hall makes a reference to the cooling of the condensed steam water on its way to the air pump. Succeeding investigators have also devised ways and means for effecting this cooling where necessary, the importance of which in connection with air pump performance having long been recognised. In condensers of the ordinary type, there is a progressive cooling tendency due to the splashing from tube to tube, not only of the entire product of condensation, but of the hot water which flows to the condenser along with the exhaust steam. This cooling tendency is specially pronounced at light loads, and being beyond control is conducive to unnecessary thermal loss. As a means of further reducing the steam-water temperature, a number of the lower rows of tubes are frequently submerged by means of a weir, over which the water must flow before reaching the air pump suction. In this way the pump temperature is made as low as is possible in the given conditions, the result being an increase in the ability of the pump to create a pressure difference between itself and the condenser.

It has been found that even with what is called a normally air-tight system, and a pump volumetrically and mechanically adequate to deal with such air as there is, the use of a " cooler " will favourably influence the vacuum.

In a compartmentally drained condenser, such as the Contraflo, this water cooling is not brought about by showering the product of condensation over the tube surface, since an essential aim of the design is to entirely separate the condensing and cooling functions. With this in view, a distinct compartment is located at the bottom of these condensers, through the tubes of which flows circulating water at the lowest available temperature. By a suitable regulating valve, some or all of the condensed water from the top compartments may, if desired, be passed into this cooler, which thus provides the engineer in charge with a ready means whereby the air pump capacity may be adjusted to the requirements of the plant in a very simple manner. (Fig. 8).

Obviously, the volumetric capacity of the air pump should be such that under normal conditions of air leakage and sea water temperature it will dominate the plant while dealing with relatively uncooled feed water. In the event, however, of a maximum demand for power, an abnormal air leakage, or an increase in the temperature of the circulating water, the cooler may instantly be requisitioned, and the vacuum increased to the utmost possible in the conditions, with a minimum loss of feed temperature.

For use where high vacuum is desired concurrently with high thermal efficiency, an arrangement of wet and dry pumps has been devised, the sealing water for the dry pump being continuously cooled by passing through what is called a " circulating " cooler. (Fig. 9).

Under this system the hot water from the condensing compartments is drawn off by a wet pump and passed into the hotwell at the highest available temperature. The dry pumps—two being frequently used working in parallel—are sealed with water which is kept in continuous circulation through a cooling compartment arranged in the bottom of the condenser, surplus water resulting from vapour condensation in the upper part of the cooler overflowing amongst the water discharged by the wet pump and passing on to the boiler feed pumps. Clearly, this arrangement secures both maximum thermal efficiency and maximum air-pump capacity, its application being, of course, largely, though not necessarily, limited to land plants.

Main Condensing Plant in Modern Cargo Steamers.—Under the increasing intensity of both national and international competition, steamship owners are obliged to examine every possible means whereby operating expenditure may be diminished. This being so, it is somewhat surprising that the condenser should hitherto have received such scanty attention, especially in view of its undoubted economic importance.

We have already briefly examined some recent developments capable of more or less general application, and will now outline the latest departure in main condensing plant

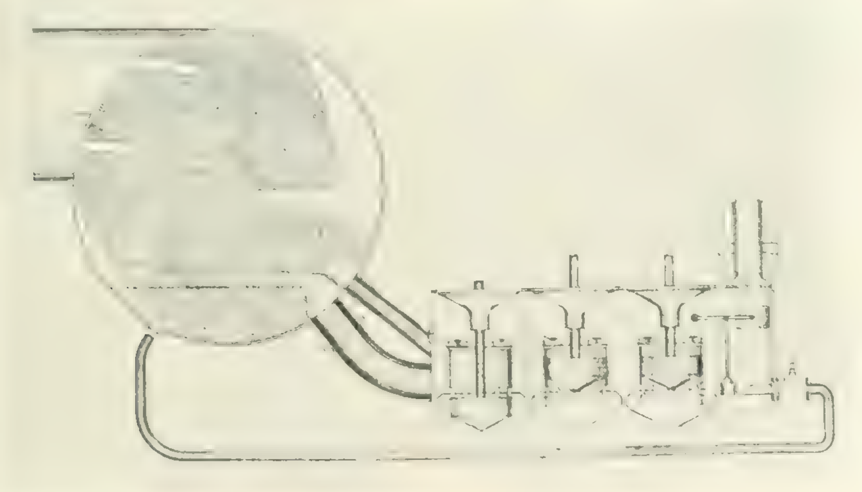


Fig. 9.

as supplied in connection with triple-expansion marine engines.

Figure 10 gives a good general idea of the surface condensing engines of the s.s. *Gwladys*, owned by Messrs. H. T. Symonds, Samuel & Co., of Cardiff, and engined by Messrs. Richardsons, Westgarth & Co., Ltd., Hartlepool. The engines are $\frac{25'' \times 40'' \times 67''}{45''}$ and exhaust into a Contraflo condenser having 1675 square feet of tube surface. As a controllable cooler is provided the water of condensation may flow to the air pump either directly and uncooled, or *via* the cooler, through which it circulates by gravity, and through which it makes three passes. (Fig. 8).

During the recent trial trip this machinery indicated 1700 H.P., so that the provision of condensing surface is equal to about 1 sq. ft. per I.H.P. when the engines are working at maximum power. The controllable cooler system being installed, the plant may be worked to the best advantage under many conditions. For example, in comparatively cold home waters, the temperature requirements

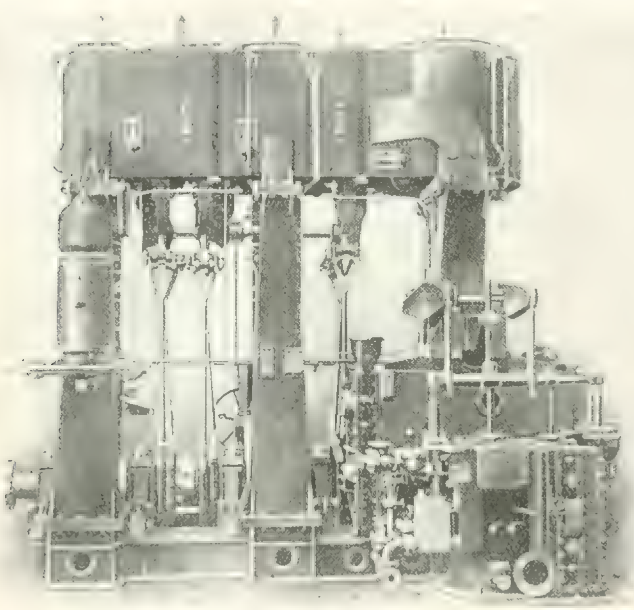


Fig. 10.

of the air pump might be adequately met even with all the water of condensation flowing directly and uncooled to the air suction. Should the vessel be sailing in tropical waters, however, or should for any reason unusual air leaks develop, the air pump effect can be maintained by passing through the cooler the whole or any desired portion of the steam water. At the trials of the *Gwladys* the effect of the cooler was to increase the vacuum by $1\frac{1}{2}$ in., from $27\frac{1}{8}$ in. without the cooler, to 28·6 in. with all the water of condensation flowing through it. In this instance there was an abnormal air leakage, and the figures obtained confirm in a striking manner not only the excellent condenser performance, but the pronounced influence of temperature on air pump capacity.

Further reports show that in 80°F. sea water the vacuum was raised $2\frac{1}{2}$ in. by the action of the cooler.

A significant feature of the *Gwladys* installation is to be found in the open character of the back of the engines, due to relatively small condenser dimensions. The greater accessibility thus afforded is clearly seen from the illustrations, and will doubtless be appreciated by all marine engineers.

Air Leakage Indicator.—While the presence of air in a condenser manifests itself in a variety of ways, engineers have long stood in need of simple apparatus whereby the relative amount of air passing through the system could be visibly indicated to those in charge.

Such a device has recently been designed by Professor Weighton, and it is now possible to detect at a glance any

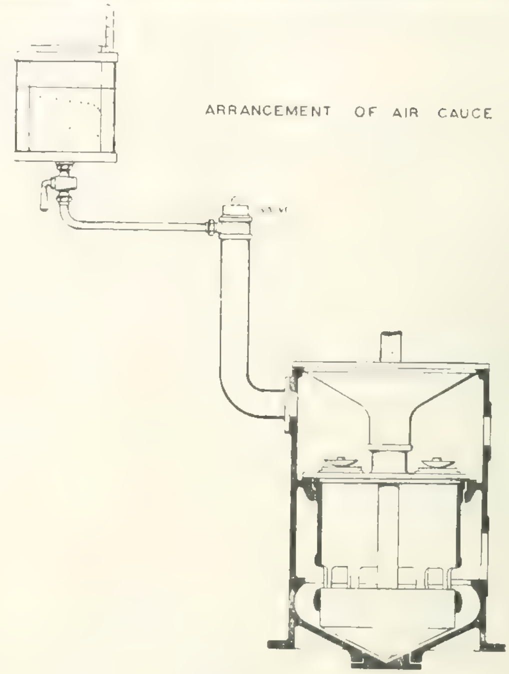


Fig. 11

abnormal leakage of air into a given system, or any failure of the air pump to do its duty continuously and uniformly.

Figure 11 illustrates the arrangement of a Weighton air gauge with non-return valve and connections. The particular instrument here shown is of the floating bell type, and consists of a glass cylinder closed at the bottom, containing a perforated float. To take an observation the non-return valve is lowered, the gauge at once coming into operation

Fig. 12.

and indicating the number of cubic feet of air which are being discharged in a given time. Figure [illegible] shows this design of gauge quiescent.

Another design has been evolved with a fixed bell, the air discharge pipe communicating in this instance with the interior of a stationary chamber, around the surface of which are several rows of small holes. The glass container is dlled with water until the uppermost row of holes on the bell is just submerged, the effect of air admitted thereafter being to depress the water level within the bell and bring successive rows of holes into operation according to the increase in air leakage. From previous calibration, the quantity of air discharged can be at once estimated, and the relative air tightness of the plant determined. Figure 13 illustrates the gauge at work, and shows the effect of a heavy increase in air leakage.

Since the presence of air influences so unfavourably both condenser efficiency and power production, the Weighton gauge is certain to prove of real service as a means whereby a given condensing plant may be tuned up and maintained at work with maximum efficiency.

Fig. 13

Auxiliary or "Winch" Condensing Plant.—It is rapidly becoming an established practice to discharge the exhaust steam from deck machinery and other auxiliaries into a separate surface condenser. In the absence of such provision the auxiliary exhausts must be taken to the main condenser, or blown out into the atmosphere, either directly or through what is called an "exhaust tank."

The objections to leading the exhausts of auxiliary machinery into the main condenser are that it involves :—

(*a*) Continuous fouling of the main condensing surfaces by oily sediment and a consequent reduction in condenser efficiency.

(*b*) Risk of injury to the boilers from the same cause, together with a diminution in both economy and evaporative power.

(*c*) Inability to open up the main condenser for inspection or cleaning while in port discharging cargo.

In the case of turbine steamers such an arrangement is still more inadmissible, in view of the supreme importance of air-tightness.

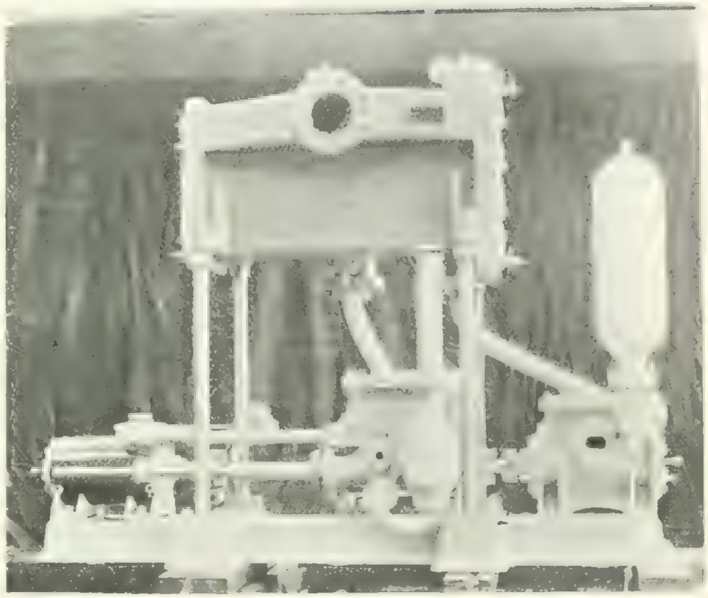


Fig. 14.

When exhausting directly into the atmosphere, it is necessary to provide (and perhaps purchase) a continuous supply of cold feed water of whatever quality may be available, as well as an amount of coal sufficient to heat the feed up to the temperature of the exhaust. As to the exhaust tank, since it consists merely of a large chamber located between the auxiliary machinery and the waste steam pipe, its only effect is to trap a limited quantity of oily water, the comparatively pure steam blowing away into the atmosphere.

It is easily seen that a separate surface condenser affords the only satisfactory means whereby the auxiliary machinery may be worked on an economical basis, and the problem is to provide apparatus whereby the exhaust steam may be condensed at the least possible cost, and the resulting feed water returned to the boiler at the highest temperature attainable in the given conditions.

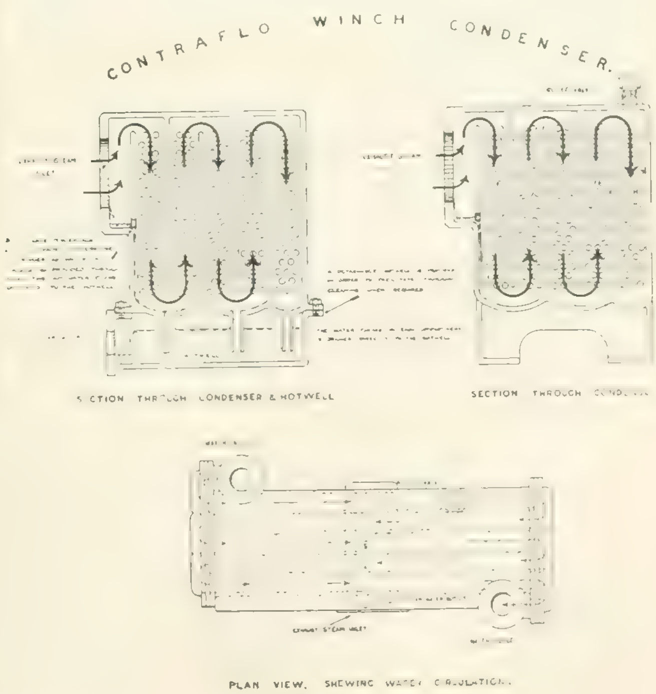


Fig. 15

Opinions differ as to whether auxiliary condensers should be worked at atmospheric pressure or under vacuum, some engineers preferring to carry a few inches of vacuum with a view to better drainage of the cylinders, valve chests, and exhaust pipes. While this arrangement has certain advantages, it involves a relatively large amount of condensing surface, lowering of the feed temperature, and the initial and working costs of an air pump.

Where the air pumps are separately driven, it is possible to utilize them in connection with the auxiliary condenser, but as cargo steamers are invariably equipped with air pumps, integral with the main engines, the scope for this arrangement is necessarily limited to those passenger steamers and war vessels which are provided with independent pumps.

Vacuum Type Auxiliary Condensers.—Speaking generally, a convenient installation should provide for a vacuum of from 5 in. to 10 in., thus condensing the steam and keeping the pipes clear with a condenser and air pump of minimum size, discharging relatively hot feed water, and requiring a small expenditure of pumping power.

A somewhat similar plant is illustrated herewith (Fig. 14), the example shown being now in operation at the Royal Albert Dry Docks Works of Messrs. Lester & Perkins. This set comprises a surface condenser of the Contraflo type combined with horizontal steam-driven air and circulating pumps. As provision is made both for thorough sectional drainage and effective disposition of the tubes, the utmost use is made of the available condensing surface, in addition to which means are provided whereby the water of condensation may flow either direct to the air pump, or into a cooling compartment which can be created at will by simply raising a regulating valve controlling the depth to which the lower tubes are submerged. From observations made on this condenser while under full load, it is found that notwithstanding heavy air leakage, a vacuum of 20 in. may be maintained with a condensation rate of fully 25 lbs. of steam per sq. ft. of surface per hour, and an expenditure of cooling water equal to thirteen times the feed.

These results represent the day-to-day performance of the plant when the temperature of the circulating water is 60° Fah.

Non-Vacuum Type Auxiliary Condensers. In surface condensers of this type exhaust steam from the auxiliaries is condensed at atmospheric pressure without the complication and working expense of an air pump.

Briefly, the advantages of this system are that it makes possible the use of a condenser of minimum dimensions, affords relatively high temperature feed water, and permits of simple arrangements being made for the removal of oily drainage.

The sectional drawings (Fig. 15) illustrate an auxiliary condenser of this type, arranged in accordance with the Contraflo system. The apparatus consists virtually of five condensers arranged in series, the objects being to secure both maximum temperature feed water and high surface efficiency. By disposing the tubes in five vertical compartments, the circulating water can conveniently be given a long effective tube length, the path through the condenser being equal to five times the length between tube plates. As each condenser section is drained directly to the hotwell, the feed water is collected at a very high temperature. Actually, the temperature of the feed water discharged from condensers of this type averages from 180 to 190° Fah., though it has risen as high as 204° Fah.

All marine engineers fully appreciate the importance of this hot water, and the coal loss involved by large differences between the temperature of the feed and the temperature of the exhaust.

Other features of this design include :—

(*a*) A provision for direct drainage to the hotwell of any water which may flow into the condenser with the steam.

(*b*) Water-sealed connections from each compartment to the hotwell, thus eliminating any short-circuiting tendency.

(*c*) A detachable hotwell, which may from time to time be disconnected for thorough cleaning.

(*d*) Simple and effective apparatus has also been devised both for extracting grease from the exhaust steam and clearing the steam water of concentrated oil drainage.

It can be seen that with an auxiliary condenser of this type the cost of discharging cargo will be definitely reduced, since the feed water can be pumped back to the boiler at a temperature of fully 180° F. Moreover, this feed water being pure and free from grease, the boilers are safeguarded and their efficiency maintained.

Conclusion.—To progress in engineering generally, there can be no such thing as finality, so that even now it is impossible to predict what the morrow may bring forth.

Notwithstanding this, perhaps it is profitable to briefly review from time to time both past progress, and such lines for future development as may seem promising. If in attempting this for surface condensation, the writer has succeeded in interesting any members of the Institute, he will feel amply repaid.

In any event, the subject is well worthy of discussion by marine engineers, who in times past have been not only the largest users of surface condensing apparatus, but the most progressive designers.

The writer desires to thank Mr. L. D. Wingate and other members of the Hartlepool staff of Messrs. Richardsons, Westgarth & Co. for very valuable assistance in connection with the preparation of diagrams and lantern slides.

LIVERPOOL ENGINEERING SOCIETY.

The Presidential address was delivered to the Liverpool Engineering Society by Mr. A. R. T. Woods, the newly-elected president, who was introduced by Mr. Thos. Duncanson, the retiring president, at the opening meeting of the new session held in the Hall of the Royal Institution, Liverpool, on November 4th. The subject dealt with was refrigeration, and the importance which it has attained in the engineering and the commercial world. It was pointed out that the experimentalist in the laboratory arrives at results which indicate to the inventive faculty of the engineer the mechanism necessary to produce similar results on a scale adequate to utilize these for the purposes of trade and commerce. The preservation of food stuffs by means of ice gradually led to the manufacture of machinery for the same purpose, and on a more extended scale ; following upon this step came the improvement of machinery which, during the last twenty years, has been very considerable, and still continues. Besides the great improvement in machinery and its application to obtain more economical results, considerable improvements, founded upon experience and carefully tabulated results, have been made in the over-sea transport of food stuffs. While in the early days of the carriage of meat, it was the practice to freeze hard, the more modern view, generally accepted, is to maintain a steady temperature of not much below 32°. The details of the sea transportation of produce had been improved and were being improved, and the trade had enormously increased for the benefit of all classes in the community. The extent to which this increase has reached was evidenced by a series of tables which gave the exports of meat, butter, cheese, fruits, etc., from the British possessions and foreign countries to the United Kingdom.

The special conditions necessary for the carriage of fruits and other produce were dwelt upon and the importance not only of preserving such free from spoiling in transit, but also of exercising that knowledge and care which are equally necessary to preserve the delicate flavour which give the charm to certain fruits and produce. Not only should the carriage of such produce be considered in all its bearings, but the treatment before shipment from the outports and the best time of gathering the various fruits should be studied by the exporter in order that his produce should reach the market in its best possible condition. It was further pointed out that while improvements had been systematically made and carried out, in connection with over-sea transport, there was very great need for improvement in the land transport and receiving arrangements, and these should receive immediate attention and be subjected to supervision and inspection equally with the ships in which the produce is carried.

THE FLEETS OF THE MAIL LINES.

(*From our Own Correspondent.*)

The Cunard Company.

IN mid-November I spent a day in Liverpool and took the opportunity to see once more the two great Cunarders. The *Mauretania*, after her fruitless attempt to enter the dock on the Cheshire side, was safely laid on the blocks of the Canada graving dock, and it was said that two thousand men were at work on her, and will be kept busy at her overhaul till the end of the year. At all events there were a great swarm of workers. All four propellers were off, the work for the removal of the steel bracket was commenced, and the rivets were being cut to enable the stem to be taken out and straightened. The damage there is really slight. The twist to her nose is hardly noticeable if one does not look for it. But the work of taking the great forging out and replacing it will be arduous and costly. Besides all this there are overhauls and adjustments in the engine rooms, and improvements in a number of directions. Then I took the tender to the sister *Lusitania*, lying in the Sloyne. Her stay in the river was a short one and a fleet of lighters were engaged in coaling her. So every port hole was closed to keep out as much of the dust as possible and screens were rigged along the stanchions of the promenade decks. What a business is the ordinary turning round of a great liner! Clean linen in van loads and new bedding by the lorry-full coming from the landing stage, an army of French polishers and upholsterers at work in the public rooms and all sorts of adjustments and renewals going on in every part of the ship. How many of the passengers who would embark on the Saturday for their trip across the Atlantic would dream of the immense care and thought that had been devoted to the task of insuring comfort and safety throughout the voyage for every one, whether of high or low degree, who had trusted himself to the premier Atlantic Company. Yet it is this immense care for the minutest details that has built up Cunard's unrivalled record for safety at sea.

The Event of the Month

has undoubtedly been the attack of the German lines upon the Canadian trade. Canada, though growing in wealth and population every day, is not yet a populous country. She already has great steamship facilities. During the last few years the Allan Line has added many first-class steamers to its fleet, culminating in the turbine-engined vessels *Victorian* and *Virginian*. The Canadian Pacific has built the two *Empresses* and the Dominion is now about to reorganize its service with greater ships, including the 14,500 ton *Megantic* and *Laurentic*. Can the trade stand other competitors? I doubt it. And I take the liberty to say that Herr Ballin is playing the game too high when he says to an interviewer that "Germany is about to take her share of the trade which has long been overdue."

The Queenborough and Flushing Route.

There seems to be no doubt that the managers of this line will, in view of the renewal of their mail contract with the Dutch Government, construct some three turbine-engined vessels for the service, and it is said that the Fairfield Company has actually secured the order. The Dutch naturally desire that money which is provided, to some extent at least, by the taxpayer, should be expended in the country, and the contract contains a condition that these new vessels shall, if possible, be built in Dutch yards. It is now, however, stated that it will be practically impossible to do this, and the Company will probably find it advantageous to pay the fine of 15,000 florins stipulated as payable in case of breach of this condition, and having paid it, take advantage of its freedom so as to give the orders to British shipbuilders.

The Messageries Maritimes.

There was talk of the British Government going into the steamship trade when the existing arrangements between it and the Cunard Company were entered into in respect of the *Lusitania* and *Mauretania*. But the French Government now purports to go into an even closer relationship with the Messageries Maritimes. The whole organization of the company is to be revised and much new tonnage is to be provided out of funds to be raised on debentures guaranteed by the State. The return to be made by the Company will be such that it will at any time be possible to revise the amount of the subventions payable for postal services rendered, according to the conditions at the time prevailing. Further, after the shareholders have received a certain amount of dividend, the State will be entitled to take a share of any excess earnings. Personally, I should much like to see the exact details of the scheme. For though the State guarantee of the loans will assuredly enable the Company to raise funds at the minimum rate of interest and so keep down debenture charges, there is nothing else that can be done by public assistance. The idea that bringing in the State will at the same time increase earnings and afford improved services seems based on a fallacy. For improved services generally involve increased cost. They can only be remunerative when the advantages offered to the public induce a great extension of business, and there is no indication that I can see of the source from which a volume of new trade is to be got.

Board of Trade Inquiries.

There have been two inquiries held by order of the Board of Trade during the last two months which have occupied an unusual amount of time and attracted unwonted attention in the public mind. These were those relating to the misfortunes of the yacht *Ceylon* and the steamship *Oxus*. In each case there seems to have been an underlying suggestion of the possibility that the causes of disaster were sometimes outside the ordinary perils of the sea and those usual failures of skill and care, which bring about shipwrecks. In each case the result of the inquiry has been to silence all such suggestions.

Let me briefly deal with the *Ceylon* case first. The yacht in question was off St. Catherine's Point on the night of the 10th September when fire broke out in her cabin. The outbreak extended rapidly, and the crew had to abandon the vessel. She was, however, eventually towed into Southampton a practical wreck, and after some delay docked in Messrs. Stephens's yard at Hythe. There on the 28th September it was discovered by the manager of the works that some lead piping connected with the soil pipes of the yacht's water closet had been cut. So at the inquiry the underwriters were represented by counsel and it was clearly suggested that an attempt had been made to cast away the ship. But the long interval which had elapsed between the arrival of the ship in Southampton and the time at which the damage was discovered, and the fact that, during a great part of that time, she had been left at the mercy of the casual passer by, made it impossible to assume that the injury had been sustained before her arrival, and in point of fact the Court was actually of opinion that it occurred whilst she was in port. Then they also found that the fire was due to the slipping of a lamp which had been, perhaps incautiously, placed on a polished table in the cabin. Further, it was shown that the owner of the yacht was in such financial circumstances as to make it pretty certain that the insurance money payable on the policies was quite a matter of indifference, so far as he was concerned, whilst the yacht herself was a possession which he would have some difficulty in replacing. Thus in the end the case terminated, as it obviously should have done, with an expression of opinion that the loss of the *Ceylon* was due to quite an ordinary peril of the sea.

The other case was that of the steamship *Oxus*, a vessel of 915 tons gross register, built in the year 1890. The *Oxus* sprang a leak some twenty-eight miles to the west of Vigo and foundered five hours after the inflow was discovered, her crew having abandoned her about an hour before the final catastrophe. In this case it was shown that the ship, which the owners valued at £14,000, was insured for £10,000, though there were also policies outstanding on freight disbursements and such like to amounts exceeding another four thousand pounds. The Court, however, considered that the value thus given for the *Oxus* was much exaggerated, and that at the time of her loss she was not worth more than some £6000. She was thus much over insured by her owners, and in addition there were known to be P.P.I. insurances for another £1300. These had been taken out nominally to cover commissions by persons who had no connection with the adventure. Obviously then the ship was worth a good deal more if she were lost than she ever could be if she completed her voyage in safety. This being the fact close

inquiry into every circumstance connected with the wreck was most desirable. Such close inquiry was assuredly given. It appeared that at 3 a.m., it being the second mate's watch, the master came on deck alleging that the ship had struck something. The mate did not think she had, whilst the man at the wheel stated that he had felt nothing unusual. The master, however, persisted in his view, and eventually had the well sounded. There was a foot of water in the hold. This rapidly increased to 30 inches, and the ship was vainly put to the land. Two hours and a half after the supposed striking her engines were stopped and her fate was practically sealed. The Court in the end came to the conclusion that the ship was navigated with proper and seamanlike care, that she was not prematurely abandoned, and that the cause of the inflow of water—which must obviously have been very great—was a mystery which they had completely failed to solve. The master's suggestion that it was due to injury sustained by striking wreckage was, in their opinion, that which would have presented fewest difficulties, but unfortunately for it, the general weight of evidence adduced before them did not go to prove that any one, except indeed the master, had suggested that any shock of striking had been noticed. This inquiry also ends, it will be observed, in the silencing of all sensational suggestions.

The Port of Southampton.

Interesting developments are taking place at Southampton. The South-Western Railway Company has given notice of its intention to apply to Parliament for powers to construct another large graving dock—probably of a length of one thousand feet. This is not by any means a surprising announcement in itself, as further dock accommodation will assuredly be welcome enough in view of the advent of the large steamers which are to be added to the fleet of the White Star Line within the next few years, and of the increase in size of the foreign vessels which frequent the port. But it is the position of the proposed dock which lends interest to the news. It is to be made on the other side of the Itchen to that on which Southampton lies. For the purpose before them they are purchasing some 160 acres of land from Mr. Tankerville Chamberlayne. The plot is situated at Weston, a little below the Woolston works of Messrs. Thornycrofts. It is somewhat curious to see a sort of Birkenhead making its appearance at all events on paper, at the Hampshire port. But history does seem ever to repeat itself.

Provisions at Sea.

In a recent issue of these notes I referred to the interest which the Government, through the Board of Trade, is now taking in enforcing the law that duly qualified sea-cooks shall be carried by foreign-going British ships. A new point has now been raised, though not this time by the Board of Trade. Ten members of the crew of the steamship *Barbary* of Liverpool summoned the master of that ship for not affording to them, when on a voyage to the River Plate and back, the amount of meat to which they were entitled under the provisions of the Merchant Shipping Acts. The men did not deny that they had had the weight which the law enjoins, but they alleged that it was in some cases made up of but two-thirds meat and as much as one-third bone. The men's contention seems to have been that "meat" under the Statutes means "meat without bone," and in the event the magistrates adopted this view, and fined the master on each of the ten summonses. The point is, of course, a highly important one to all concerned and it will be well if it can once and for all be authoritatively settled. One is glad, therefore, to learn that there is a probability that it will go to a Divisional Court of the King's Bench on a special case to be stated by the magistrates, who heard it.

Sandy Hook Lightship,

which in the days prior to the advent of Mr. Marconi and his useful invention, was so eagerly looked for by the west-bound Atlantic traveller, is a thing of the past, and Sandy Hook itself will therefore lose much of its international fame. The lightship which up to now has been the sentinel at this important post—where watch has been kept by her and her predecessors for half a century—has become obsolete and has been removed. A new and up-to-date craft has been substituted and she is to be called the *Ambrose Lightship*, in order to mark the fact that she indicates the entrance to the new and important entrance to the port of New York.

Eastern Records.

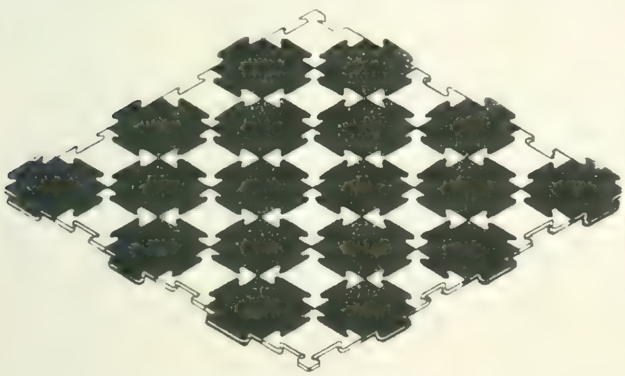
The steamships of the Ellernan line have recently been shortening the time occupied on their passages to Indian ports to a remarkable degree. But it is asking too much for them to claim that their steamship *City of London*—as they say, an "unsubsidized steamer"—has beaten the mail steamer *Macedonia* by a few hours. It may be indeed that the voyage of the *City of London* from Liverpool to Bombay occupied less gross time than that of the *Macedonia* of the P. & O. Company between London and that same eastern port. But the time spent in port by the two steamships and their contract obligations to the Government have to be taken into the account. When that is done it will be recognised clearly enough that the mail steamer travelled at a far higher rate of speed. The *City of London*, on the one hand, set forth free from all obligations and could make a few calls and spend as much or as little time in her ports of call as she wished. The P. & O. steamer, on the other hand, had to make certain obligatory visits and leave her ports on certain scheduled dates. She thus had to spend a full twenty-four hours at Marseilles waiting for the hour fixed for her departure. Again, her time of leaving Suez is a fixed hour, controlled, not by her own movements, but by the arrival at Port Said of the Brindisi mail steamer which brings the final consignment of letters from London—letters which left the metropolis a week later than the *Macedonia* herself. To any one who knows these things, and who has any personal knowledge of the capabilities of the two steamships concerned, the idea that the *City of London* could beat the *Macedonia* "by a few hours," or at all, is calculated to raise a very broad and lasting smile.

Lloyd's C.C. Annual Dinner.—The annual dinner of the Cricket Club in connection with Lloyd's Register of Shipping was held in the Trocadero Restaurant on Hallow E'en. There was an excellent gathering of members and their friends. The chair was taken on the occasion by Mr. Andrew Scott, secretary of Lloyd's Register, and he was supported by the chairman of Lloyd's, members of the committee, Sir Walter Howell, Sir W. H. White and others. The programme of speech, recitation, music and song was not only framed with a view to edify and amuse, but interspersed with the announcements were quotations from the modern classics, so that the mind was not starved while the body was being satisfied with the good things provided. After the loyal toasts the chairman proposed the health and continued success of "The patrons and the committee of Lloyd's Register," to which Mr. Jas. Dixon responded in a speech which was listened to with wrapt attention and appreciation of its sympathy and humour. Previous to this toast, however, the secretary of the club, Mr. F. A. Mayne, in the response to the toast of "Our Club," proposed by Mr. G. Dalton Hardy, gave the twenty-seventh annual report in the somewhat unusual form of blank verse, or an approximation to it. The humour and hits which were blended in the report brought forth responsive echoes from the memories of the members, while the more general references to passing international and political events were appreciated by a larger audience. The toast of "Our outpost members," given by Sir John H. Luscombe, was responded to by Mr. Mumford, from Constantinople, and Mr. Williamson, from Japan. "Our old boys and visitors," proposed by Mr. J. T. Milton, was responded to by Sir W. H. White and Sir Walter J. Howell. The health and continued happiness of the Chairman, proposed by Mr. C. H. Jordan, was warmly received and evidenced his popularity, both with the cricket club members aud the entire audience. Mr. Scott responded and the pleasant evening closed amid the refrain of Auld Lang Syne. During the evening the following gentlemen entertained the company by music, recitative or song :—Messrs. F. W. Holloway, J. Montgommerie, J. L. Kitcat, W. P. Collings, Alick Manley, A. R. Dyer, Chas. Spray, Ernest Oliver, Chas. Squires, with Mr. F. W. Holloway, F.R.C.O., as accompanist. The records of the matches were printed on the artistic programme for the evening, and the scores gained by the members of the club. A silver cup was presented to the member whose eminence in the scores was greatest, and to the next another silver souvenir, while to the captain was given a locket with provision in it to contain the ratification of an event evidently looked forward to by some of the members as on the eve of accomplishment.

INTERLOCKING RUBBER TILING.

AN extremely ingenious method of interlocking rubber tiling enabling a great variety to be carried out as to range of colour and character of design, has been brought to our notice by the New York Belting and Packing Co., Ltd., of 91, Chambers Street, New York, and 11, Southampton Row, London. It is claimed that these tiles have great advantages over all other known forms of tiles and floor coverings; for example, a floor covered with these tiles is noiseless, non-slippery, waterproof, thoroughly sanitary and is claimed to be so durable as to last a life-time without requiring repairs, and for ship and yacht work, will stand the racking without cracking or chipping.

We illustrate in the adjoining diagram a floor tiled



with this system, from which it will be seen that each tile interlocks with four other tiles. The character of the particular design or pattern is obtained by interlocking in conjunction with the various colours of the tiles themselves.

These tiles may be laid directly upon an existing floor, whether of wood, cement, stone or metal, therefore saving the expense of constructing a concrete floor, which is absolutely necessary in all other kinds of tiling.

As the tiles are not laid in cement the work of laying can be accomplished at any time without interruption.

Institution of Engineers and Shipbuilders in Scotland.—The "house-warming" of the new halls and offices of the Institution of Engineers and Shipbuilders in Scotland is to take place on Friday, 4th, and Saturday, 5th December, when the buildings will be open for inspection by members and friends with afternoon tea as a concomitant. Mr. John Ward, president, will deliver his presidential address on December 8th in the large lecture hall, and on December 11th Sir John Wolfe Barry, K.C.B., LL.D., F.R.S., will read a paper on "Standardization and its Relation to the Trade of the country." The new building, which is situated at the corner of Elmbank Street with Elmbank Crescent, opposite Glasgow High School, and was fully described and illustrated in our issue for April 1st last year, is a handsome block in the later English Renaissance style. It is arranged in three floors and a basement, and contains lecture halls, ante-rooms, council and committee rooms, library, reading, and secretarial rooms. The large lecture hall will seat an audience of about 500.

THE RIGHT HON. LORD INVERCLYDE.

WE have pleasure in giving with this issue a photograph of Lord Inverclyde, the third holder of that title, whose proudest connection in shipping circles is perhaps that with the great Cunard Company. His father was originally plain Mr. John Burns, but he subsequently became a baronet in 1889, and finally (in 1897) first Baron Inverclyde. These honours descended to the present holder on the lamented decease of his elder brother, who died in 1905, a victim to overwork. Thus the Right Hon. James Cleland Burns is the third Baron Inverclyde. He is a Justice of the Peace for the county of the City of Glasgow and for Lanarkshire and Renfrewshire, Lord Lieutenant of Dumbartonshire and a Deputy Lieutenant of Renfrewshire, Chairman of the Glasgow City Mission and President of the Scottish Hockey Association. These things we mention to indicate the breadth of his interests, which extend beyond those shipping connections with which both by descent and surroundings he is so intimately connected. Prior to his accession to the title he was chiefly occupied with the management of the old Glasgow shipping house of Messrs. G. and J. Burns, which, it may be remembered, has only recently taken advantage of the acts relating to the Limited Liability. This concern is, of course, one of the oldest and most respected in the country. It was to Messrs. Burns, already established as shipowners in the steamship trade of our western seas, that Mr. Samuel Cunard, of Halifax, Nova Scotia, turned when he came to England in the late thirties, full of his project to establish regular steam communication between the two hemispheres, and it was to Messrs. Burns' far-sightedness that much of the success of the adventure was due. When differences of opinion arose between the old firms connected with the Cunard Company at the time of its becoming a public company, the MacIvers left, and the Burns family stuck to the old business. Their policy has ever been a forward one. The first Lord Inverclyde saw the need for building great and fast steamers and made a new departure in the construction of the *Servia*, first steel steamer in the New York trade. The second peer was chairman in the days when the present great vessels were designed. He lived to see the success of the *Carmania* and to know that the arrangements whereby the construction of the *Lusitania* and *Mauretania* became possible, were completed. The present peer did not become a director of the Cunard Company till the time at which he inherited the title, but like his brother he was an early and ardent supporter of the turbine principle, which he introduced with great success into the latest addition to the fleet of fast mail steamers which the Burns Line maintain on the route between the Clyde and Belfast. He is also responsible for the strengthening of this organization by the absorption of the old-established Dublin and Glasgow Steam Packet Company. He is indeed essentially a shipowner and a man of affairs. Amongst his interests are the Clyde Steamship Association, of which he is a Director, and the Glasgow Shipowners' Association, of which he is chairman. He is also a member of the committee of Lloyd's Register of Shipping, attending to the business of this important organization both in London and in

Glasgow. He was President of the Chamber of Shipping of the United Kingdom in 1899, and has done much important public work as a member of that Royal Commission on Shipping Rings which has distinguished itself by the numerous sittings which it has held and the patience with which it has listened to all the tales which have been told before it in the guise of evidence. He is also an honorary member of the Advisory Committee on lighthouse works and in that capacity has done his share to use practical business knowledge for the purpose of making the public expenditure of light-dues as useful as possible to those who go down to the sea in ships. As one who is in the forefront of progress in steamship construction he is, of course, connected with the Institute of Naval Architects, where he is a member of the Council, and with the Institute of Engineers and Shipbuilders in Scotland. As a yachtsman he is a member of several clubs, including the Royal Yacht Squadron, the Royal Largs Yacht Club, of which he is Commodore, and the Royal Northern and Royal Highland Yacht Clubs of which he is a Vice-Commodore. Born in 1864, he is still a young man. He has been married some seventeen years, his wife being a daughter of the late Robert Nugent-Dunbar, of Machermore Castle, Kirkcudbrightshire. His heir is the Hon. John Alan Burns, born in December, 1897, and he has also two daughters. He may be taken as a good representative of that old commercial family of the highest traditions and instincts, full of activity and public spirit, with which the country is still plentifully blest and of which it is not unreasonably proud.

New Dock for Aberdeen.—The Works Committee of the Aberdeen Harbour Board have adopted a proposal to construct a new dock on the river Dee at the cost of £85,000. The entire scheme, which is part of a large project for dock extension would take about three years to carry out and the Local Government Board are being approached with the view of monetary assistance being given to the project, which is being undertaken largely to give work to the unemployed.

Motor Exhibition.—The motor exhibition held at Olympia in November was a successful one, judged by the show of cars, machinery and accessories, and by the large number of visitors. In spite of the condition of trade and the want of employment, the exhibits this year were composed to a greater extent than hitherto of private cars and carriages; the trade and commercial cars, boats and machinery specially adapted for such being quite in the background. With such a display of good work in the body of the hall and in the annexe, with the crowded details in the gallery, it is unbecoming to select any firm or car for special mention. The "Valveless" engine, however, may be cited as something new, also a simple type of gear with change speed without the use of mitre wheels and the complication in the gear case. In place of the spur or mitre wheel driven by a pinion gearing into it, there is a disc with holes at different diameters to suit the required speed, and a small sprocket, the projecting teeth of which gear into the holes in the disc, which can be moved to meet the different diameters. The elimination of thrust and friction in such a type of gear is obvious. It is reassuring to motor car manufacturers that at the meeting of the Institute of Metals held at Birmingham, in the course of a discussion on aluminum, it was stated that manufacturers had increased their output and were working on the lines of extension of business with lower prices, rather than on the reverse lines, and that there would not be a return to the high cost ruling in the market until a comparatively recent period.

NAVAL MATTERS—PAST AND PROSPECTIVE.

(*From our Own Correspondents.*)

Devonport Dockyard.

One launch is very like another, but it is not often that the ceremony is performed by such a distinguished personage as the wife of the Prime Minister. The ceremony in connection with the *Collingwood* on November 7th was in every way a success. As the cord was severed the hull, weighing 7500 tons, moved down the ways and gracefully entered the Hamoaze to the accompaniment of cheers and "Rule Britannia." A most distinguished company was present, including representatives of the Spanish, Japanese, Portuguese and Swedish navies, the Prime Minister and several Admiralty officials, including the First Lord and the Director of Dockyards. The Admiral-superintendent and Mrs. Cross were afterwards "At home" in the Mould Loft, and in the evening they entertained a large number of guests at dinner, including the Prime Minister and the First Lord. On Sunday morning the distinguished visitors attended divine service on board the cruiser *Leviathan*, the flagship of Rear-Admiral Denison, afterwards visiting the cruiser *Forth*, the parent ship of the submarine flotilla, and going on board one of the submarines. After taking lunch at Admiralty House with the Commander-in-Chief and Lady Fawkes, they returned to town. We are now, of course, interested in the vessel that is to take the *Collingwood's* place on the slip, but beyond the fact that she is to be an improved *Invincible*, nothing is known. The official laying down is arranged for February, but preparations will no doubt be taken in hand before then. A supplementary grant of £20,000 has been made to Devonport with the object of helping the unemployed during the winter, and this will enable about five hundred men to be taken on. Quite 3000 applications were received in the constructive manager's department, the majority of the men being unskilled labourers. The grant is very welcome, as it will permit repair work being done which would have had to be postponed. As the result of the engineers' strike, all the money provided for the *Téméraire* has not been expended, and efforts will be made to push the vessel on as quickly as possible, so that her completion may not be delayed more than is absolutely necessary. The *Téméraire* is to have a searchlight equipment, consisting of eleven projectors, two of them being of 36 in. in diameter and one 24 in. We have had a visit from the sister vessel, the *Bellerophon*, which came in while the Russian training squadron was here. The Russian officers and men were very much interested in the new ship. The refit of the battleship *New Zealand* has been completed, and on November 12th she proceeded to Portland to rejoin the Channel Fleet. Her refit included the provision of magazine cooling appliances, high-power wireless apparatus and fire-control fittings. The *Roxburgh*, of the First Cruiser Squadron, is to have her refit completed by December 15th. The battleship *Mars*, of the Home Fleet, was at the beginning of the month taken into dock for a refit, which will occupy until the beginning of the new year. The Home Fleet returned from its cruise on October 30th, after an absence of two months. Rear-Admiral Denison will not be in command of the fleet much longer, as on January 3rd he completes his twelve months. His successor will be Rear-Admiral Burney, an officer well known here, having been inspecting captain of boys' training ships at the time of his promotion to flag rank last year. In some quarters the special service ships of the Home Fleet are regarded as being in a moribund condition. That this is an error is proved by the fact that the battleship *Repulse* on a recent steam trial steamed for four hours at an average of 15·3 knots per hour. All the special service ships go out for gun and steam trials occasionally. As I anticipated would be the case, Captain Tuke came here on November 17th to succeed Rear-Admiral Ommanney as captain and deputy superintendent of the yard and King's harbour-master of the Hamoaze. Another important promotion has recently occurred. Engineer-Captain Wishart, who has been since July of last year manager of the engineering department, having reached the rank of engineer-rear-admiral. Consequently he loses a good service pension of £150 a year which

he had been in receipt of since April last, when the pensions were instituted. It is understood that he will retain his post on promotion, thus placing his department on an equality with the engineering departments at Portsmouth and Chatham, who each have an engineer-rear-admiral at their head. The vacant pension has been awarded to Engineer-Captain Little, who is now serving in the battleship *King Edward VII.*, the flagship of the Channel Fleet.

Sheerness Dockyard.

At Sheerness we are quite satisfied with our share of the spoil under the scheme for assisting the unemployed during the winter. The additional wages will amount to £2500, and this is to be expended in expediting the refits of destroyers. The harbour is full of vessels. The Home Fleet returned from its cruise on October 28th, being met at sea by the Fifth Cruiser Squadron, with which exercises were carried out. In addition to our own vessels, there were six of the Portsmouth Division and two belonging to Devonport. It was probably the most powerful fleet ever seen at the mouth of the Thames. The following day the Portsmouth and Devonport ships proceeded to their respective ports. On November 16th nine of our largest vessels went round to Portsmouth to take part in the reception of the King of Sweden. The autumn cruises having now been completed, attention will be paid to docking. Two of the Fifth Cruiser Squadron have gone to Chatham for that purpose—the *Cochrane* and the flagship *Shannon*. A change has taken place in the command of the squadron, Rear-Admiral Callaghan having gone to the Mediterranean as second in command in place of Vice-Admiral Prince Louis of Battenburg, who has taken command of the Atlantic Fleet. Admiral Callaghan has been succeeded by Rear-Admiral Lowry, from the Royal Naval War College, Portsmouth. A change, too, will take place in January in the command of the local division of the Home Fleet, Rear-Admiral Briggs having been appointed to succeed Rear-Admiral Colville. We have had several of the Eastern Group of Destroyers for refit, among them the *Lively*, *Cherwell* and *Erne*, which have now returned to Harwich, and the *Ettrick*, *Usk* and *Ribble*, the latter for machinery defects. The *Garry*, of the same flotilla, has been dry docked and an examination made of her underwater fittings. Four of the new ocean-going destroyers are to join the flotilla, the *Swift*, *Amazon*, *Ghurka* and *Saracen* having been ordered to replace the scout *Attentive* and the destroyers *Lively*, *Locust* and *Panther*. Commodore Bayly, who has been in command of the flotilla for the past eighteen months, has left to take command of the Royal Naval War College at Portsmouth. The torpedo gunboats *Jason*, *Leda*, *Speedwell* and *Gossamer* are also in hand, together with several torpedo boats. The *Gossamer* has been employed for some years in instructing ratings from the Naval Barracks in steaming water-tube boilers. That training has now been discontinued, and when her refit is completed the vessel will join the Home Fleet. Torpedo boat No. 115 has been placed in the steam basin for repairs, having damaged her stern in collision with Torpedo boat No. 071 in Stangate Creek in consequence of her steering gear not acting. Several plates on the port side of the latter vessel will also have to be replaced. The Nore Division of the Home Fleet will before long be one of the most powerful squadrons in the world. The battleships *Bellerophon*, *Téméraire*, *Superb* and *Lord Nelson* and the *Indomitable's* two sisters have all been told off to join the Division. The *Invincibles* will take their places temporarily in the battle squadron, so that the vessels of the *Majestic* class can be transferred to the Portsmouth and Devonport Divisions. A remarkable coaling feat was performed by the *Indomitable* before she proceeded to Berehaven at the beginning of the month, she having taken in 1300 tons of coal from a collier at an average of over 201 tons an hour. The cruiser *Endymion* has returned from Chatham and resumed her duties as gunnery training ship, after having been refitted and having had alterations made in her armament. The cruiser *Charybdis*, which recently returned from Colombo with the paid-off crew of the *Astraea*, will not rejoin the Home Fleet just yet, having some work to be taken in hand at Chatham. Our assistant King's Harbourmaster, Lieut. Munro, has designed a new mark buoy for firing ranges, and the Admiralty think so much of it that they have ordered several to be constructed. The distinguishing feature in connection with the buoy is that it will keep an upright position in a rough sea.

Portsmouth Dockyard.

The event of the month was, of course, the arrival of the new honorary Admiral of the British Navy—the King of Sweden. To do honour to His Majesty the Home Fleet assembled in force at Spithead on November 16th, when the King and Queen arrived from Cherbourg in the Royal yacht *Victoria and Albert*, escorted by the cruisers *Achilles*, *Minotaur*, *Natal* and *Warrior*. The destroyer *Welland* also formed part of the escort, this being so as to enable wireless telegraphy to be carried on with the cruisers. The fleet was under the command of Vice-Admiral Sir Francis Bridgeman, who had his flag in the *Dreadnought*, the other vessels being the battleships *Agamemnon*, *Magnificent* and *Victorious* and the cruiser *Indomitable* of the Nore Division; the battleships *Illustrious* and *Jupiter* and the cruiser *Essex*, of our own division; the battleship *Cæsar* and the cruiser *Donegal* from Devonport; and the cruiser *Topaze* (flying the broad pennant of Commodore Bayly), the scouts *Attentive* and *Adventure*, and twelve of the most modern destroyers of the Eastern Flotilla from Harwich. Altogether it was a magnificent spectacle, comprising as it did all that was newest in the way of modern naval construction. As a result of the arrangements to engage extra men for the winter months about six hundred hands have been entered, and this will probably be increased to a thousand. A number of the new hands have been put to work on the *St. Vincent*, as the completion of that ship is to be expedited. Most of the boilers and machinery have arrived, as has also a large quantity of armour plates, and the vessel is now in No. 15 dock having the side armour fitted. Extra men have also been put on the cruisers *Berwick*, *Terrible* and *Hampshire* and the battleships *Vengeance* and *Swiftsure*. The latter vessel is to be completed by November 30th and the *Hampshire* by December 5th. Nine or ten destroyers are also undergoing refits and others are waiting their turn. The battleship *Dreadnought* is due here from the Nore on December 19th for a refit. Her sister vessel, the *Bellerophon*, has now completed her trials, all having been satisfactorily performed. When the cabin fittings and furniture are done she is to join the Home Fleet at the Nore. This should be early in December. The new battleship, which is to be laid down on January 1st, will furnish work for many of the new men. The vessel is provisionally named the *Foudroyant*, and will be an improved *St. Vincent*, but no details are yet obtainable. It is expected that by the end of December, or the beginning of January, a large quantity of material will have been delivered. The exact date of commencing the vessel will, of course, depend upon the quantity of material received. It does not appear as if the new lock will assist the local unemployed much, navvies only being required at present. Very few of these are in the town and about five hundred are to be brought from Scotland. The great dam in the harbour, for enabling the entrance to the lock to be made, is being built, huge timber piles being driven down. Steel piles for the foundations at the entrance are also being driven down. The Admiralty have informed Admiral Sir Arthur Fanshawe, the Commander-in-Chief, that they have noted with much satisfaction the successful result of the salvage operations on the *Gladiator*, and direct that the officers and men who were engaged on the work be informed of their Lordships' high appreciation of the manner in which these difficult operations were brought to a successful conclusion. On November 2nd half-a-dozen of our destroyers went to sea for exercises and target practice. In the evening a telephone message arrived stating that several 12-pounder shells had passed over some houses in Bembridge, Isle of Wight, and embedded themselves in the open fields. Fortunately, however, no one was injured. The Commander-in-Chief immediately sent instructions to stop the firing and investigations were afterwards made into the affair. Two officers from the yard—Lieutenant Lockey and Mr. Bell, assistant constructor—have been on a visit to Dundee on behalf of the Admiralty to investigate the suitability of a part of Dundee Docks as a depot for submarines.

Chatham Dockyard.

We have been allocated £16,000 out of the £73,500 voted to assist the unemployed in the dockyards during the winter.

This will allow of about five hundred more men being employed up to the end of the financial year. Up to the present nearly four hundred hands have been taken on. Our basins and docks present a busy appearance. The new cruiser *Indomitable*, which had been here for some weeks to be fully completed before commencing her duties in the Home Fleet at the Nore, went to Berehaven to calibrate at the beginning of November, afterwards going on to Spithead to take part in the reception of the King and Queen of Sweden. After that she was to leave for a fifteen weeks' cruise for experimental purposes. The *Cochrane*, of the Fifth Cruiser Squadron, come in for a refit on October 30th, the *Shannon*, the flagship, following a fortnight later. On November 4th the *Black Prince*, of the First Cruiser Squadron attached to the Channel Fleet, arrived, and the battleship *Venerable* is also shortly expected. The refits of the two battleships of the Channel Fleet, the *Irresistible* and *Triumph*, are to be completed respectively by December 12th and 26th. The *Triton*, which has been surveying on the East Coast, has come in as usual to be laid up for the winter and docked for repairs. Her officers, however, will not be idle, for they will be busy tabulating the results of their season's work. The cruiser *Endymion*, having completed her refit, proceeded on October 29th to Sheerness to resume her duties as gunnery training ship. The refit of the *Cressy* is also completed, and she is now ready to join the Fourth Cruiser Squadron. We are awaiting the decision of the Admiralty as to the *Gladiator* with some interest, as it is understood that if she is to be made good for further service the work will be done here. The probability is, however, that the vessel will not be put right. Still, in these days of experiments one never knows what will be done. A remarkable question was asked in the House of Commons as to the cruiser *Diadem*, which is under repair here, the inquiry being as to whether she was in such a dirty, verminous and generally insanitary condition as to be detrimental to the health of the workmen employed on her. Mr. McKenna replied that the statement was without foundation. A shipwright recently employed in the ship died from enteric, but there was no evidence that the disease was contracted while he was at work on the ship. A start has been made with the construction of the tugs *Pilot* and *Atlas*. It is a pity that such a large slip as No. 8 cannot be put to better use. On December 2nd we shall lose Admiral Sir Gerard Noel, the Commander-in-Chief at the Nore, who has held the post since the beginning of last year. His successor is to be Admiral Sir Charles Drury, who has just left the Mediterranean, and who was not very long ago at the Admiralty as Second Sea Lord. It is anticipated that when Admiral Noel leaves he will be promoted to the rank of Admiral of the Fleet. Sir Gerard has a splendid record of service and he is the senior of his rank—although seniority does not count, the appointment of Admiral of the Fleet being made by the King himself. Commodore Bradford, of the Depot, is also leaving on account of having been promoted to flag rank. He will be succeeded by Captain Troubridge, who was chief of the staff to Admiral Drury in the Mediterranean. Captain Troubridge is probably the only officer in the British Navy who was present at the chief naval actions during the war between Russia and Japan, having been the naval attaché at Tokio at the time. A sad occurrence took place at the Naval Hospital on November 14th, Vice-Admiral Sir Henry Barry dying there on that day. It was only a month previously that he returned from the Mediterranean in his flagship the *Bacchante* and was succeeded as Rear-Admiral of the Third Cruiser Squadron by Sir Henry Jackson. By Admiral Barry's death Rear-Admiral Finnis, who was last year in command of the Nore Division of the Home Fleet, gets a step, and Captain Carden, of the battleship *Agammemnon*, reaches flag rank.

Pembroke Dockyard.

We are to be allowed to take on 110 additional hands between now and March 31st, the end of the financial year, and already about two-thirds of them have been engaged. Some of the men are employed on the *Defence*, while work for a number of boiler makers has been found on the destroyer *Greyhound*. The acceptance trial of the *Defence*, which had been arranged to take place during the second week of December, has been postponed owing to some of the boiler tubes having been condemned by an Admiralty inspector, who recently came down to inspect them. The raising of the funnels has been completed. The revised date of the acceptance trials has not yet been made known, but the date on which the vessel is to be commissioned has been provisionally fixed for December 9th, and Captain Dampier has been appointed to the command. The *Defence* will relieve the *Achilles* in the Fifth Cruiser Squadron in the Nore Division of the Home Fleet, where two sister ships, the *Shannon* and *Minotaur* are now serving. The cruiser *Bellona* continues to make good progress. A delay in fitting the shaft tubes occurred in consequence of the castings not having been delivered to time. This, of course, necessitates a postponement of the commencement of boring operations for the four propellor shafts. As to the *Boadicea*, it has been arranged to carry out the preliminary steam trial of the turbine propelling machinery on December 21st, and the official trials ten days later. To ensure this the contractors have augmented their staff of workmen and have introduced day and night shifts. With regard to fresh work, the destroyer *Violet* arrived on November 17th from Portsmouth to have her boilers retubed and otherwise refitted. The torpedo gunboat *Spanker* also came round from the same port a few days later for her annual refit. A new steel lighter, 55 ft. long and 15 ft. wide, is to be shortly commenced. The estimated cost is £1200, of which £700 is for labour. As I anticipated last month, Captain Kingsford has been promoted to flag rank. Although at the time of writing no one has been appointed to succeed him as captain-superintendent, it is expected that Captain Mundy will come here. Promotion in the senior ranks of the Navy has been very rapid since Rear-Admiral Kingsford took up his duties on October 1st, 1906, for he was then fifty down the captains' list. His promotion, however, is not altogether advantageous from a pecuniary point of view, for, instead of a captain's full pay and a good service pension of £150 a year, he will only for the present draw a rear-admiral's half-pay.

The First Iron Ship in Scotland.—The death in Glasgow on November 1st of Mr. Thomas Wilson, mechanical engineer for the Caledonian Railway Company, on the Forth and Clyde Canal, whose forebears had been similarly employed throughout almost a century, recalls the story of the building of the first iron ship in Scotland. Thomas Wilson, the grandfather of the deceased, was a carpenter-mechanic in the employ of the Forth and Clyde Canal Co. in the early years of the nineteenth century, and constructed for that company the first iron vessel to ply in regular service in Scotland. This was the "passage boat" *Vulcan*, brought into being on the banks of the Monkland Canal at Faskine, near Coatbridge, and launched into the waters of the canal on May 14th, 1819. The story of the building of this pioneer iron ship is often referred to, and is thus suggestively told in "The Shipbuilding Industry" by David Pollock, M.I.N.A., published by Methuen two years ago. "The pioneer iron vessel in the Clyde region was the *Vulcan* built at Faskine, on the Monkland Canal in 1818. Equipped as a 'passage boat,' the *Vulcan* was probably the first iron vessel regularly employed in passenger carrying. Her builder was Thomas Wilson, a carpenter in the employ of the Forth and Clyde Canal Company. The vessel was 61 ft. long, 11 ft. beam and 4 ft. 6 in. deep, and was built of plates and flat bar frames, the framing and stanchions being forged wholly on the anvil by hand labour. While engaged in its construction, Wilson and his blacksmith assistant were frequently jeered at by sceptical fellow-workmen and passing bargemen. To the derisive query as to whether he really imagined that iron would 'soom' (float) Wilson merely retorted to the effect that they could judge for themselves if they 'pitched their tea flasks into the canal.' Heedless for most part of those jeers and scoffers, Wilson, like Noah of old, went steadily on with his shipbuilding. The *Vulcan* was not only safely floated, but commenced plying on the Forth and Clyde Canal in 1819, and was to the fore so recently as somewhere in the seventies, having actually stood the test of between sixty and seventy years' hard service." The constructor of the *Vulcan* died at the age of ninety-two years, and was succeeded by his son Robert, and he in turn was followed by his son Thomas, who was engineer on the canal for forty years and whose death took place as above stated. There was thus an unbroken succession of the same family connected with the canal for nearly 100 years.

CHAIN-DRIVING.

ALTHOUGH it is reasonable to assume that leather belts, ropes, spur-gearing and equivalent means of power transmission will always be used in certain places and under certain conditions, it is interesting to note that driving chains, since their improved manufacture and the better general knowledge of their capabilities, have taken the place of the older methods in many instances. It has been proved beyond contradiction that chains have an advantage as to greater efficiency over other transmission gear in the direction of larger output of work, saving in power, saving in wages of machine attendant, less wear and tear of machines, saving in cutting tools used in machines, saving in light and space, and larger work being done compared with belt-driving. While there is a predetermined ratio of speed owing to the positive drive, which in itself is an advantage, a certain amount of elasticity exists between the driving and driven elements producing very beneficial effects, but where this elasticity is insufficient spring cushion sprockets can be used.

We illustrate in Fig. 1 of the adjoining diagrams the Renold Patent Silent Chain, which can be used of any convenient width upon sprocket wheels, and can be run at any speed up to 1250 ft. per minute. This is the type of chain used on the Cunard turbine steamships *Mauretania* and *Lusitania* for transmitting 400 h.p. to the auxiliary machinery.

On the *Mauretania* these chains drive from four 20 h.p. electric motors to the turning gear for slowly turning the four main propeller shafts when they have to be inspected or otherwise attended to. Twelve other chains drive from 20 h.p. motors so as to operate the lifting gear of the covers of the turbines. Similar arrangements are made on the *Lusitania*.

We illustrate in Fig. 2, which is a half transverse sectional view looking forward, the chain-driven turning and lifting gears on the *Mauretania*, the darkened portions indicating the positions of such machinery.

These chains are manufactured by Messrs. Hans Renold, Ltd., of Manchester, and are marvels of accurate workmanship.

We are indebted to Messrs. The Wallsend Slipway and Engineering Co., Ltd., for the use of Fig. 2.

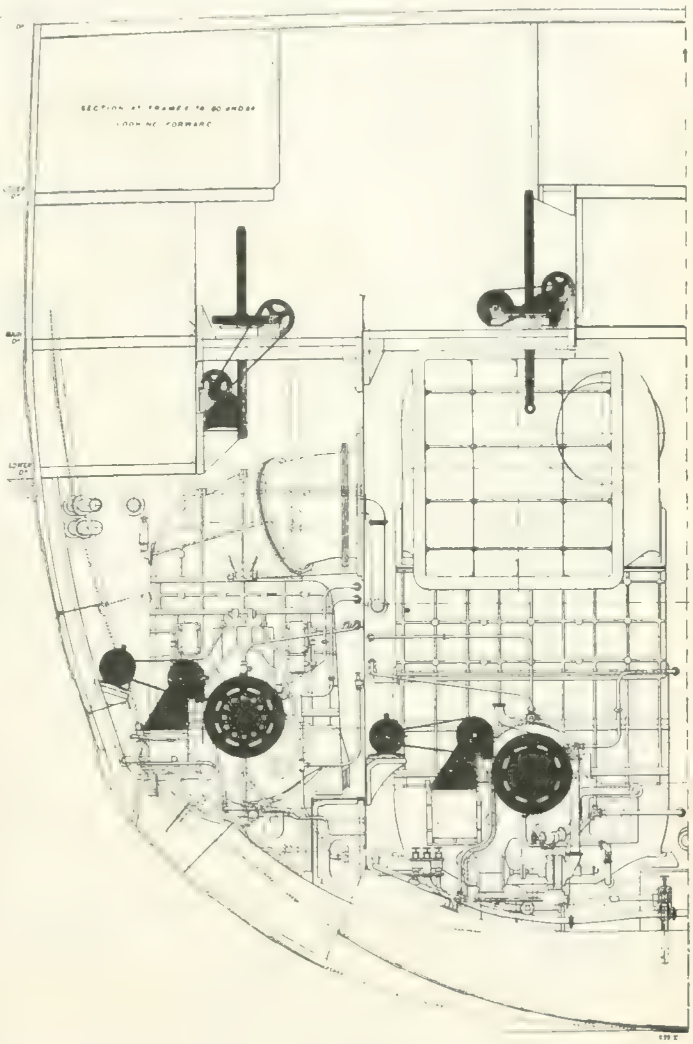


Fig. 2. Section of frame looking forward.

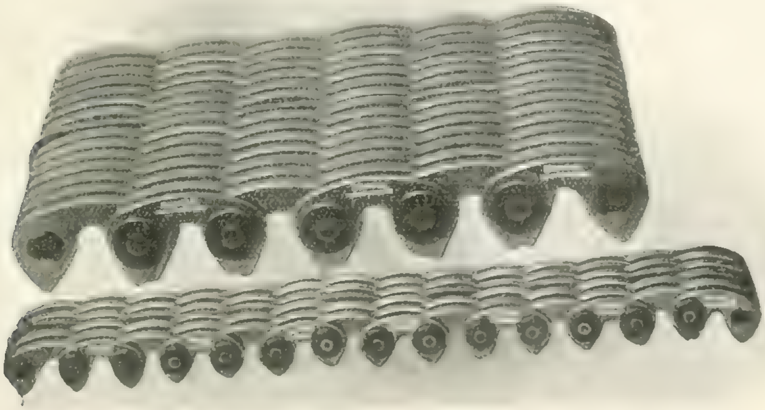


Fig. 1. Patent Silent Chains with hardened steel bushings.

INTERNATIONAL CONGRESS AT PARIS.

Continued from page 125.

Section III.—*Continued.*

M. Heiss (Bavaria), then read a paper on the importance of having cold storage chambers at all abattoirs, and specified in detail how these should be arranged, with rules and regulations for the conducting of them for the general good of all using them. After some discussion on this, M. A. Schwartz (Austria) gave a short paper bearing on the same subject. A discussion ensued bearing on the question of preferential use of refrigerated produce. M. Ragozinski (Moscow) presented resolutions having for their object the establishment of sectional storage places to facilitate the transport of produce.

On October 9th, after a few remarks by members in this section, several resolutions were proposed and carried, with the object of encouraging the development of the transport by sea of refrigerated produce from the colonies and elsewhere, including fish, and that measures should be taken to organize a trade and see into the best arrangement for storage and transit from the seaports. M. H. Sölling described a method of packing fish, superior to the ordinary one, by wrapping in vegetable parchment, water and air-proof. The fish are gutted and washed, then wrapped and placed in ice. He cited experimental cases where soles, turbot and other fish had been kept fresh and good thus for twenty to thirty days. M. Gruvel gave a paper advocating the development of trade with the Colonies of France, by means of the refrigerating industry. M. R. Basadre (Brazil) presented a review on the refrigerating industry in Argentina. Some discussion then ensued on the means of transport from the seaports to the congested districts and towns—to Paris, for instance, and it was urged that the best means should be provided and expedition used in the transport. At the afternoon meeting, M. H. Cullen (Argentina) remarked in continuation of his former paper that peaches had been successfully carried in refrigerated compartments over sea. M. Bullo followed by remarking on the development of refrigeration in Italy. Resolutions were submitted urging on governing bodies and railways to modify rates to encourage transport, and establish stores. M. G. H. Powell gave further information on the subject of fruit exports, pears, apples, etc. A long discussion followed bearing upon the carriage of fruit, and a resolution was passed advocating that the attention of the Minister of Agriculture should be called to the subject. On October 10th, several points formerly brought forward in papers were discussed and resolutions passed with the object of increasing facilities and improving methods for the carriage of refrigerated produce, also erecting stores for hospital use. The carriage of butter then engaged the attention of members and was discussed at some length and the meeting closed.

On October 10th, considerable discussion ensued on the treatment of milk, which resulted in a resolution on the subject to the effect that, as refrigeration was an excellent means for the preservation of milk, on sanitary and other grounds its treatment by refrigeration should be encouraged and that careful inspection and supervision were necessary. A paper by M. Beyer Nick was given by the Secretary, dealing with the influence of low temperature on microbes, and confirming the views previously expressed and specially referring to the work done by Dr. Bordas in this branch of the subject. Further papers and discussion followed dealing with the dietetic value of refrigeration and the careful inspection of animals at the abattoirs. Several members continued the discussion and M. Rey Basadre spoke for the quality of the meat exported from Argentina to Britain, which was under careful supervision, and M. Gilbert Anderson spoke up for New Zealand exports. After some further remarks, the view was expressed and agreed to that it had been demonstrated that refrigerated meat was nourishing and good and in no way inferior to fresh killed. Doctors L. Jacob and Sabareanee presented their views on the utility of refrigeration in hospitals and medical institutions and advocated refrigerating chambers and stores. Dr. Schoofs (Belgium) gave his testimony on the subject, dealing with it from a hygienic point of view. A brief discussion ensued and the meeting closed.

On October 12th, in general assembly, M. Kammerlingh-Onnes submitted propositions to the effect that for the study of refrigeration an international association should be formed to further the work aimed at by the Congress. Other resolutions followed.

On October 10th, M. J. F. H. Koopman (Holland) proposed several points, which were discussed, bearing upon the best system in use and the most efficient condensers and fittings, and the difficulty with joints and leakages. Prof. Pflaunder presented some pamphlets bearing on the investigations made by himself and his assistants. M. Barrier, president, and other members entered upon a discussion on the facilities which might be granted by the authorities to reduce the working expenses and to further the establishment of refrigerating plant. Further discussion resulted in resolutions as to the encouragement of the study of refrigeration at technical schools and colleges, arousing the interest of municipal and other authorities and establishing an international association. The service rendered by refrigeration in connection with explosives was considered and a resolution was proposed calling attention to the value of refrigeration in preserving powder. Prof. A. Schwart (Austria) dealt with refrigeration for abattoirs and the great progress made in these establishments. M. A. Noodt referred to the impregnation of wood for preservative purposes; M. R. Balfour, M. H. Williams and others urged the importance of a process to preserve wood for insulation. The construction of refrigerated stores was specially referred to by M. H. Williams.

On October 12th, in general assembly, a resolution was proposed that an international committee be appointed to name and fix standards of units for the refrigerating industries with a view to universal capacity measures. A number of resolutions followed bearing on the results of the sectional papers and discussions.

Section IV. Amphitheatre Guizot.

The meetings of the Fourth Section were held in the Amphitheatre Guizot, and were opened on October 6th, by M. M. Boudouard, D.Sc. (Paris) with a paper on the use of cold dry air in the manufacture of pig iron. The initial stages of this industry were commented upon and the gradual improvements made from time to time cited, with descriptions of the several processes which had been in use, resulting in economy as well as increase in the productive power of the plant. The introduction of the process of cold air for blast furnaces was due to M. Gaylay, who was followed by others. The headings under which economy was effected were stated to be reduction in consumption of fuel; increase in production of cast iron; increase in produce of the blowing machines; regularity in the blast furnace. Some discussion ensued, which was followed by a short paper by M. Schmidt on the application of cold for mining, boring through sand and similar purposes. M. Guiselin then read a paper on the extraction of paraffin from crude oils by cooling, stearine and margarine being extracted by a similar process, the details of which were explained. The oil, being put into circulation in contact with artificially cooled walls, deposits a paste, from which the paraffin becomes the residue under compression in filter presses where the semi-liquid oil is extracted. M. de Goes (Paris) in two short papers described the process and emphasized the importance of the application of artificial cold in the manufacture of powder and explosives. A paper by Mr. H. Birkett (London) was next submitted, referring to the application of refrigeration to several industries and stating that by a process of sterilizing meat after killing, it could be carried in a chilled state for long distances and kept perfectly fresh.

In the afternoon, M. Porgès (Vienna) gave a paper on the manufacture of paraffin and gave a description of the refrigerating plant used in Austria, where ammonia machines are in use to cool the brine for the crystallizing tanks. He also commented on the systems used elsewhere. On October 7th, M. Fernbach, who presided, opened by remarking on the many ways in which refrigerating machinery was now applied, instancing specially the breweries. A paper by M. Spaleck (Austria) was submitted, describing the details of the application of refrigeration in the manufacture of beer; and another by M. L. Verhcht (Belgium) on a branch of the same subject. Dr. Carles then gave a paper on the treatment of wines in process of manufacture and maturing. Dr. Bruno Haas (Vienna) followed by another paper dealing also with wines. A discussion ensued and was succeeded by a paper on the application of refrigeration to purification. Two resolutions recommending the use of frozen meat and the exercise of care in the manipulation and transit of it from start to finish were then passed and the sitting was closed by

M. G. Bullo (Italy), who gave the resumé of a paper on refrigerating machinery installed in Italy. On October 8th, the proceedings were opened by short communications from M. Stier and M. A. von Gunten (Switzerland) on the manufacture of ice and by M. F. H. Abbey (New York) on the handling of ice in the manufacture and distribution to the consumer. M. Basadre then gave a paper on the refrigerating industry in the Argentine Republic, which was followed by one on the manufacture and distribution of ice in Vienna by M. A. Bauer. Dr. Bordas gave a short paper on the use of ice generally and its bearing on the health. A discussion ensued and then a paper on the same subject from a sanitary point of view was given by Dr. F. Schoofs (Liège); a resolution was then submitted, recommending that precautionery measures should be adopted to prevent impure ice being placed on the market. M. G. Bruere and M. L. Pierucci gave some interesting remarks on the care exercised in obtaining pure ice and the means used in the filtering of the water for making ice. On October 9th, several papers were read dealing with the preservation of plants, flowers and vegetables, and a resolution was submitted and carried, to the effect that laboratories with refrigerating plant should be established and encouraged for the study of all the questions in connection with horticulture and floriculture.

Section V. Amphitheatre Salle du Doctorat.

The Fifth Section meetings were opened on Oct. 6th under the presidency of M. Pérouse in the Salle du Doctorat. A paper by Mr. H. J. Ward (London) was submitted, dealing with the development of the trade in bananas. A detailed description of the construction of the cold chambers in the latest type of steamers was given, in which it was pointed out that the spaces were divided off into bins by sparring, thus providing ventilation and checking movement of the fruit during bad weather. The bananas are gathered a few hours before shipment into the compartments, when cooled down ready to receive them; the first bunches are set on end, the second lot are placed horizontally. The suction fans and ventilators, also the refrigerating machinery, were described, also the conveyors for the rapid shipment of the fruit with the least possible handling. After shipment the machine is kept running continuously for two or three days to reduce the temperature of the fruit below that which would ripen it and just sufficient to preserve it. The quantity of bananas imported to Britain in 1907 was given as 4,500,000 bunches. In the United States of America the trade had also increased enormously.

M. de Sytenko (Russia) then gave expression to some views on the importation of dairy produce and game from Russia into France, and especially on the disabilities under which such imports suffered, such as high duties, local dues, market taxes and the want of cold stores which could be used for the cheap storage of butter, eggs, poultry and game; all these tended greatly to increase the cost to the consumer. It was a matter of great regret, he considered, that greater facilities were not organized to suit this trade. Continuing the subject, M. Von Wendrich gave a paper dealing with details of the requirements, from statistics which had been gathered from reliable sources, showing the produce carried by cars, barges, steamers and to the various districts; such statistics gave an excellent opportunity of knowing how trade was developing and in what directions, indicating also where facilities should be given to extend trade. The progress of civilization depended on the progress of commerce and the furtherance of means of inter-communication for sale of produce between one nation and another. The refrigerating industry afforded a good opportunity of placing within reach of large populations the produce of agricultural districts, such as meat, butter, eggs, milk, fish, game, vegetables, fruit, etc., by providing depots and central markets, railway stations, sea and river ports, wharves, transport stock, suitable for carriage by rail, steamer, barge, etc. The heads under which statistics had been obtained were stated to be:— 1. Capacity, efficiency of land, river and sea lines. 2. Duration of transport of goods. 3. Duration of non-use of cars, barges, steamers, etc. 4. Cost of transport (tariffs and rates received). 5. Working expenses (cost price). An interesting review of the working of this statistical system was given, showing its results in Russia and the improvement and economy effected by the management. It was also pointed out that to overcome the difficulty in the difference in gauges of rails, the cars were made with adjustable axles so as to admit of ready change at the frontiers. It was proposed that an International Permanent Committee should be organized to continue the work of the first congress of the refrigerating industries held in Paris, so that congresses of a similar character could be held, information collected and books, reviews, papers, statistics, etc., published.

Professor Blitz urged attention to the supervision of refrigerated produce both at the despatching and arrival stations, in order to protect the public and give assurance to the consumer that supervision was strictly exercised. M. G. Bullo (Italy) then gave a historical sketch of the refrigerating industry in Italy, showing the development from refrigeration by means of ice to the most recent machinery imported, on the Linde system. The different industries which benefited by the installation of refrigerating plants were then enumerated. The paper was illustrated by graphic diagrams showing the progress made in Italy of refrigerating since 1882.

M. H. C. Cameron, on behalf of M. Critchell, presented a paper on the subject of the importation from the colonies of produce by means of refrigerated transports to Britain. He gave a history of the progress which had been made in this trade during the last twenty-five years, giving also a tabulated statement showing the immense increase in the tonnage engaged in the carriage of butter, eggs, fruits, rabbits, fowls, game, salmon, etc., in addition to sheep and lamb.

Mr. T. Coghlan (Australia) continued by advocating the desirability of extending the trade in refrigerated produce, and pointed out the advantages to be derived from its encouragement and development. Food for the great mass of the people was brought near and at a price which enabled the poorer classes to live better and on more sustaining food. This had been the case in Britain and there was room for further extension. M. Preedy (New South Wales) followed by pointing out the great possibilities which lay in the lands of Australia for supplying the nations of Europe with food stuffs by means of refrigeration. The colonies of France could no doubt accomplish something in this direction, also, as the colonies of Britain had. M. G. Anderson (New Zealand) remarked upon the growing importance of the trade in refrigerated cargoes of meat and other produce from Australia and New Zealand, a trade which would be recognised of value to the importing nation more and more.

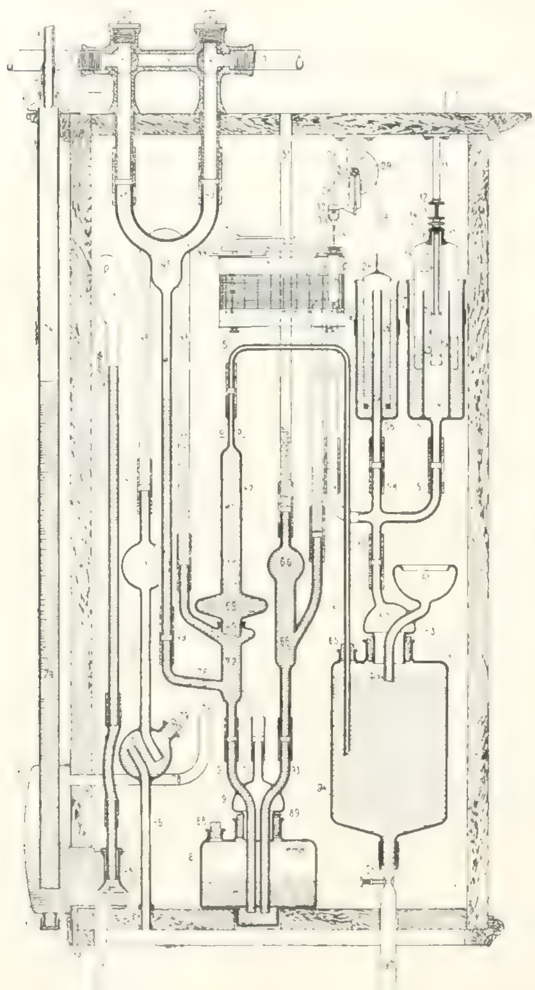
M. Powell (United States) gave a very complete paper on horticultural products and how these are distributed throughout the markets of America in refrigerated cars, of which there are about ninety thousand used in the United States, Canada and Mexico, also by about fifty thousand miscellaneous cars of other types. In 1907 nearly sixty thousand cars of fruit and vegetables were moved in the United States, besides large quantities of fruit and vegetables in specially ventilated vehicles. The fruits of California are distributed over wide areas, and the products of Texas and Florida are sold in markets from one to two thousand miles distant, indeed, the extension of the area of distribution depends upon the distance that such products can be carried economically in a wholesome condition. Two elemental points of great importance are the careful handling of the produce in the fields and in packing, so that there may be no damage done during preparation for shipment. 2. The method of shipment under refrigeration, so that the cooling may be done quickly to preserve the fruit and vegetables. Most of the defects which develop into disease are due to abrasion of the skin or outer surface in the course of handling of fruit, as the blue mould of citrous fruits and apples, the black moulds of the small fruits and the mould of grapes can be prevented if the preservative skins are unbroken. These points were emphasized and had been the subject of careful study and experiment. The difficulty of transporting fruit, especially the more delicate species, was explained, and it was pointed out that the cooling of the produce and keeping it at a temperature of about 40° during its transit, admits of fruit being gathered in a more mature condition than when it is allowed to ripen in transit at a higher temperature, due to inefficient cars.

(*To be Continued.*)

INSTITUTE OF MARINE ENGINEERS.—The conversazione in connection with this Institute will be held at the Holborn Restaurant on Friday, December 11th.

SCIENTIFIC BOILER CONTROL.

At the Institute of Marine Engineers, Stratford, on Monday, Nov. 9th, a lecture was given by Mr. G. A. H. Binz on "Scientific Boiler Control." Mr. J. T. Milton (member of Council) presided. After remarking upon the large amount of waste, even with experienced firemen, due to the usual methods of stoking, Mr. Binz advocated as a remedy a continuous and automatic analysis of the products of combustion which would indicate the method of stoking that produced the best results. The carbon in the coal, he said, was not always burned to CO_2, it might be changed only to CO, or any particle of CO_2 might be retransformed into CO if it should, in its passage through the firebed and flues to the chimney, come into contact with atoms of highly heated carbon. The proportion in which



The "Sarco" Automatic Combustion Recorder. Sectional Elevation.

these two gases were present in the furnace gases could only be determined by chemical analysis. A pound of dry carbon burned entirely to CO_2 gave heat equal to 14,600 B.T.U., whereas the same weight of the same carbon burned to CO only yielded 4,450 B.T.U. It therefore followed that if there was a low percentage of CO_2 in the exit gases a lot of the heat was lost, and, inversely, a high percentage of CO_2 denoted good combustion. This percentage could be ascertained by means of a CO_2 recorder, an instrument which produced, practically automatically, a certain number of records per hour of at least one of the products of combustion and the most important one. There were two factors to be considered in estimating the CO_2 contents of the exit gases; the presence of CO when the percentage of CO_2 was high, and the temperature of the gases at the stack. As CO was a heat absorber, it was obvious that it would be of little use to produce a set of conditions which, whilst securing a high percentage of CO_2 also had a tendency to encourage the presence of CO in appreciable quantities, but the admission of air was all that was necessary to prevent this initial formation. The possibility of the transformation of CO_2 back to CO was very remote as long as the percentage of CO_2, as shown by the recording instrument, was not more than 14 to 15 per cent., and the formation of CO under those conditions was most probably due to a low velocity of the gases in the furnace at a high temperature, which encouraged contact of particles of CO_2 with highly heated carbon. A high temperature at the stack was due either to conditions unfavourable to complete combustion of the fuel and the gases given off by it immediately over the grate, or to too high a draught pressure. The results in the former case would be shown on the recorder, but in the latter case it was advisable to take into consideration the temperature of the exit gases in addition to the percentage of CO_2. If an engineer could, by the use of a CO_2 recorder increase the percentage of CO_2 in the exit gases from 5 to 14 per cent., it would effect a saving in coal of 21½ per cent., and if, in addition, he succeeded in reducing the temperature at the stack by 100°, the saving would amount to 24 per cent. A "Sarco" CO_2 recorder, of which we give a view, was afterwards exhibited, and the lecturer explained its working and construction.

In reply to questions, the lecturer said the machine was mainly used on land installations, but instruments had recently been perfected with special fittings for marine work. Where there was a series of boilers the pipes conveying the gases for analyses were connected up from the different boilers so that an average could be taken for the series. In a multitubular boiler the gases were taken either from the combustion chamber or the front of the boiler as preferred. The recorded results from the combustion of oil fuel were not so good as those from coal. The opinion was given that, as the samples were taken out at intervals, a record might be obtained which would not be representative, as the samples might be taken on successive occasions when the doors were opened for firing, but the lecturer stated that this effect would not be experienced when an average was taken. It was also held that, although the recorder showed a worse record of consumption for oil fuel than for coal, it did not necessarily prove the latter to be more economical, as there were differences in the processes of combustion between the two fuels, which might not be shown on the recorder.

The meeting concluded with votes of thanks to the lecturer and to the chairman.

PARAGRAPHS.

Institute of Marine Engineers.—The discussion on the paper "Some recent developments in surface condensing apparatus," which we give in this issue, will take place on Monday, December 21st.

Messrs. J. W. Brooke & Co., of Adrain Ironworks, Lowestoft, have received instructions from Lord Li Ching-fong, of the Chinese Legation, to build him a high-class motor yacht of about 35 ft. length. The vessel will be from designs by Mr. F. Shepherd, M.I.N.A.

"The Captain in the Engine-room."—In the October report of the Marine Engineers' Association, Ltd., Mr. D. W. Bavaird, the local secretary of the Clyde district, calls attention to a matter of very general interest. "During the month," he writes, "we were credibly informed that an engineer in a local line, who had laid off for a trip for health reasons, had been granted half-pay whilst recruiting his health. Truly, it may be said, owners are at last beginning to recognise the true importance of the head of the engine department, and we are delighted to think that a change for the better is in view. The supreme head alone has hitherto been granted this favour, so that in keeping with Colonel Denny's ideas that there is also a captain in the

engine-room who is mainly responsible in making or marring dividends, this generous action gives us the utmost pleasure, and we may hope that the good example may become general."

BURNTISLAND DOCK ACCOMMODATION.—The facts that no dry dock accommodation exists on the north side of the Forth, and that over 3000 steamers annually load at Methil and Burntisland have for some time been regarded as a proof that some accommodation of this sort, along with engine and ship repairing works, is needed at Burntisland. The hope is also entertained that the naval base at Rosyth will attract vessels to the north of the Forth ports, and tend to the establishment of yards for the building and repairing of vessels. About two years ago a London syndicate negotiated with the Harbour Commissioners for the lease of several acres of ground situated to the west of the old tidal harbour. This ground, to enclose which a breakwater was constructed, was taken possession of by the syndicate, who entered into a contract with a local contractor for the seawall and excavations, but for the last twelve months or so no further progress has been made with the works. At a statutory meeting of the Harbour Commissioners on the 17th November, the matter formed part of the business, and it was intimated that a new and influential company are negotiating for the purpose of taking over the ground leased to the first syndicate. The prospect of a successful issue to the negotiations is regarded as hopeful, and it is even said that arrangements may shortly be effected which will permit of the company commencing work.

THE INSTITUTE OF METALS.—The Lord Mayor of Birmingham welcomed the members and friends of the recently-formed Institute of Metals on the occasion of their first general meeting, which was held in that city on Nov. 11th. The president—Sir W. H. White—opened the proceedings by setting forth the reasons for the formation of the new institute, which would deal with all non-ferrous metals and fulfil a very important function in connection with the structure and strength of such metals. Many problems had been put forward in other societies where it was found that no adequate data existed to arrive at satisfactory conclusions, and to deal with such problems the Institute of Metals had been formed. The objects of the Institute were stated to be to afford a means of communication between members of the non-ferrous metal trades on matters bearing upon their manufactures; to arrange meetings for discussing subjects bearing upon the manufacture, working and use of the non-ferrous metals; to advance the knowledge of metals and alloys, by the publication of papers dealing with these subjects. It was hoped and expected that the interchange of thought through the proceedings of the Institute would tend to promote improvement in the working of the metals and their alloys, and more cordial and friendly relations among the manufacturers with a view to united action in discovering the causes of defects, and eliminating these in course of manufacture when found. In commenting on the paper read by Mr. Echevarri on aluminium, which was discussed with great interest, the President pointed out that something might be done to add to the strength of pure aluminium to bring it within the reach of shipbuilders, and also find a method in its preparation to resist the action of sea water. By solving points such as these, the area of its usefulness would be greatly increased. A paper on phosphor bronze by Mr. Philip, Admiralty chemist, contained very interesting information on the subject dealt with, and indicated the properties of this compound metal with its special fitness for service in the presence of sea water, which has no corrosive effect upon it; for many details, by reason of its high qualities of structure; for boiler fittings, as rise in temperature does not impair its strength; for high speed and other bearing surfaces, as its co-efficient of friction is low. Other papers were read dealing with compound metals and the investigations in connection with alloys, their constitution and structure. A paper descriptive of a plant used in the manufacture of tubes, by Mr. W. H. A. Robertson, was also read. In addition to the meetings held for papers and discussions, members enjoyed the privilege of visiting several of the works around Birmingham. The opening proceedings of the new Institute were successful, enlisting a good number of adherents, and give a good token of the possibilities before it.

INSTITUTE OF MARINE ENGINEERS.

THE eighteenth Annual Dinner was held on Wednesday, October 28th, 1908, in the King's Hall, Holborn Restaurant. The gathering was a record one in point of attendance, and the list of guests was representative of almost every department of marine engineering and of naval and mercantile shipping.

The President, Jas. Denny, Esq., occupied the chair, and was supported by the Right Hon. Lord Inverclyde, Sir J. Fortescue Flannery, Admiral Hon. Sir Charles E. Fremantle, Sir Geo. S. Mackenzie, Hon. C. A. Parsons, Sir Jas. L. Mackay, Sir Thos. Sutherland, Sir Walter J. Howell (Marine Department, Board of Trade), Sir Wm. H. White, Sir John Gunn, Sir James Mills (New Zealand), Engineer Vice-Admiral H. J. Oram (Engineer-in-Chief, Royal Navy), Messrs. Jas. Dixon (Chairman, Lloyd's Register of Shipping), H. Cosmo-Bonsor (Chairman, S.E. Railway), R. J. Butler (Admiralty), Engineer Rear-Admiral R. Mayston, Professor Elgar, Professor J. H. Biles, John Inglis, LL.D.,* Robert Caird, LL.D., Engineer Commander W. M. K. Wisnom, Capt. A. J. G. Chalmers, (Board of Trade), Captain Dixon, Messrs. James Adamson (Hon. Secretary), J. T. Milton (Engineer-in-Chief, Lloyd's Register), Robert Clark, J. M. Ritchie. J. Foster King, (Chief Surveyor to the British Corporation), J. C. McKechnie, Andrew Scott (Secretary, Lloyd's Register), Jas. Bain* (Cunard Line), W. J. Willett Bruce (White Star Line), W. MacLeod Mac Millan, Horace J. Spence, A. Simson, A. Gracie, M.V.O.,* Thos. Bell, A. Laing,* D. J. Dunlop.

The president, after submitting the loyal toasts, called on Mr. H. Cosmo-Bonsor, who said: Mr. President, my lord, and gentlemen, I consider it a great privilege on this occasion to be allowed to propose the toast "The Shipping Interests," the most important toast of the evening. When I look around this distinguished company I wonder why I have been selected—I cannot help thinking that it is because I have a reputation for seldom speaking more than two minutes, but possibly another reason may be that, although I happen for the moment to be a mere landsman, still, I am the commander of a Channel Fleet, and in that respect it is possible that I might be giving a record which is absolutely new in an assembly like this. There is a certain spot in the Straits of Dover where, when the sea is choppy, the toast of the "Shipping Interests" would not be altogether received with satisfaction, but, my lord and gentlemen, in a gathering of this kind, I can quite understand that the toast needs little encouragement. The very fact that the shipping industry in the past has been prosperous is the reason why we are here at all to-night, and that the shipping industry will continue to be prosperous in the future is the keenest hope of all of us. Since I have been in the room, I have been endeavouring to observe some feeling of alarm, some show of trepidation, at the great competition that we all understand is to take place shortly against the shipping interests—I naturally allude to airships—but at the present moment I can see no signs of any gentleman wishing to change his present profession to go up in a balloon. Let me make a confession. Before coming here this evening, I studied all sorts of statistics which I expected to have given to you in connection with the subject of this toast, but your hospitality and good-fellowship have absolutely driven every figure out of my head, and I excuse myself with the knowledge that my friend, Sir Fortescue Flannery, who is full of figures, as he is of ability, will be able to supply all that are necessary. And now, gentlemen, all I have to do is to propose this toast, which I am sure you will heartily receive, "The Shipping Interests."

Sir J. Fortescue Flannery: Mr. President, my lord, and gentlemen. Your courtesy, confirmed by the eloquence of my old friend and colleague, Mr. Cosmo-Bonsor, has placed me in a position of great difficulty to-night, because I have to respond as well as I can to the toast of "The Shipping Interests," and many shipowners will tell you at the present time that there are no interests in shipping. They are like a character of the late J. L. Toole, who said that it was against his interests to pay any principal, and against his principle to pay any interest, and in like manner there are many shipowners to-day who pay no interest because the ships are

* Prevented by intervening circumstances from being present.

earning nothing. This is a state of affairs that you, sir, and myself, young men though we are, have seen before, and it is probably a state of affairs which I hope we may, after a time of improvement, live long enough to see again. We have seen these continual cycles of prosperity and adversity in the shipping trade, and we have known that when there is depression, as there is to-day, there is one means that the shipowners always look to to raise them out of the slough of despond, and those means are the improvements that are made from time to time by shipbuilders and marine engineers, which have the effect of lowering the cost of transport at sea, and thus making low freights payable freights, notwithstanding the fact that at first no profits could be got out of them. It is to that progress made by men such as belong to this Institute that shipowners will continue to look, and not in vain, for improving their position, and for making freights paying and profitable freights which otherwise they could not possibly be. Now, I observe around this table some gentlemen more or less connected with Government affairs, and there is one aspect of this shipping interest which I feel ought not to be overlooked upon an occasion of this kind, and that is the systematic attempt, nay, the systematic practice, of foreign governments of assisting their shipping industry, whilst our own shipping interest does not always receive the assistance from Government which many of us think ought to be given to it. I have had several instances before me of the policy of foreign governments in assisting their mercantile marine. I remember some years ago a distinguished Japanese statesman, who has been the guest of this Institute, Viscount Hayashi, formerly Japanese minister in London, was about to give out an order, or it was rumoured that he was about to give an order, for several vessels. It fell to my lot to interview Viscount Hayashi, and try by all means in my power to get him to decide to build the vessels in this country. I said to him: "Your Excellency, the ships can be built in this country cheaper, they can be built quicker, they can be built, I do not doubt, lighter, and therefore able to carry a little more, and undoubtedly, with so much greater experience, we should be able to build the vessels so that they would cost less to maintain after you begin to run them; therefore, on account of early delivery and these other advantages, I sincerely hope you will order them to be built in this country." What was his reply? He said: "I recognise with you that the ships could be built cheaper, quicker, better, and more economically in every way in this country, because we have not attained to the power of shipbuilding which you possess; but I must tell you frankly that my Government are determined that these ships shall be built in Japan, and for this reason, we want our men to be educated in shipping affairs, we want them to understand as they can only be trained to understand by actual practice, and the Government are going to make such sacrifices as the shipowners in this instance may require in order to ensure that the work may be done in Japan, for the purpose of educating and teaching the people so that they may be able to carry out similar work in the future." That was a definite policy, a policy, which, unfortunately, we cannot imitate, and which we do not want to imitate in this country, but which is very much against the interests which you and I, gentlemen, are mostly concerned in, that is, the construction and actual mechanical running of ships. There is another case with Germany and Russia also worth remembering, because it only occurred during the last two or three days. The Russian Volunteer Fleet were about to order five vessels, in fact they actually gave the order to a firm of Greenock shipbuilders, when a German firm of shipbuilders came along, and, by reason of a subsidy, which, it is rumoured was specially obtained from the German Government, were able to undercut the Greenock shipbuilder and take away, at a time when additional work is very much wanted, a very valuable contract which was gained in fair competition. I mention these things in connection with the shipping interests because I want to emphasize this truth, which I believe my friend on the left, who has so much experience on these matters, agrees with, because he suggested it to me, and that is, that we do not as engineers and shipbuilders and shipowners ask for assistance from our Government as these other foreign shipbuilders and shipowners and engineers have obtained, but we do ask very largely to be left alone, we ask to be allowed to work out our own improvement with as free a hand as we can. If we have that, and if the shipbuilders and shipowners work hand in hand and in unison, adopting those improvements which, from time to time engineers may be relied upon to put forward, we shall have that revival in the shipping interests to which we look forward and continue with a faith in the shipping interests as our means of livelihood and the occupation in which we take so much pride.

The Right Hon. Lord Inverclyde: I feel it is a particular honour that the toast which I have to submit to you has been entrusted in my hands to-night, and it is a special gratification to me that I should be allowed to propose this toast on the occasion when you have one of the great firm of Messrs. Denny as your president, because long before my time, and I think before your president's time, too, the firm with which I am connected had a great many business transactions with the firm of Messrs. Denny. As far back as 1849, steamers were built at Dumbarton for the Cunard Company by Messrs. Denny. In the year 1870, they built the *Parthia* and the *Batavia* for the Altantic trade, ships of about 3,000 tons, which were regarded as large vessels in those days, and it is interesting to compare them and their dimensions with those of the *Lusitania* and *Mauretania* of the present day. We shipowners know how much we are indebted to you engineers for supplying us with tools to carry on our trade, because, after all, it is upon you that we depend to a great extent for the economy and efficiency of the engines which you supply our steamers with. These two things, efficiency and economy, are the most important things we have to look to. Our steamers have to be efficient so that they can be relied upon to do the work we call upon them to do, and they have to be run with economy, so that, if at all possible, we may make a profit, which is a very hard thing to do at the present time. At the same time I hope you marine engineers will not go too fast for us, because I think we must blame you engineers, to some extent at all events, that our ships become so quickly obsolete—or rather, not obsolete, but outclassed by these new contrivances and inventions which you are continually bringing forward. Marine engineers certainly now give us great confidence in the engine room. It is not so long since the time when we would not think of sending a steamer to sea unless she was equipped with sails also, but I think we have now such confidence in the engineers that we do not rely upon sails as a stand-by in any way whatever. In this connection it is interesting to refer to the advertisement of the *Comet*, which sailed between Glasgow and Greenock in 1812. The advertisement read that "she was to sail by the power of wind, air, and," lastly, 'steam.'" These are anxious times for all of us who are engaged in large commercial concerns. The cost of production is increasing and we look forward to the future with anxiety, because there is a feeling of uncertainty of what may be our future, but, gentlemen, I think there is one thing that we are determined upon, that this country is by no means done yet, and we shall not allow it to lose its position as the greatest "nation of shopkeepers" in existence. There is, however, at the present time a great danger of too much interference—outside interference—with our commercial concerns. The great commercial undertakings of this country were never built up either by Government regulations, enactments or Government settlements or interference in trade disputes. They were built up by the indomitable energy, the foresight and enterprise of the men who have gone before us, and who have laid the foundations of the great works of which this country is so proud. I think, therefore, those who interfere in the trade matters of this country do not always realize how serious that interference may be. To my mind, whatever views at the present time may be put forward to the contrary, in any successful commercial undertaking there must always be masters and servants, and I do not believe that, either from the point of view of the masters or of the servants, any concern will be a success unless it is carried out on those principles. I, myself, am no believer in a business which is conducted on the basis of employer and employed. In referring to these matters I would just mention the court of arbitration which has recently been announced by the President of the Board of Trade. I am sure that the President, in establishing that court, did it with the best desires and intentions in the world, but I think we must realize that there is a great danger in the establishment of such a tribunal, which I think we must recognise is very apt to encourage disputes and to

bring those disputes forward when many of them might be settled by the ordinary laws of supply and demand and ought never to be arbitrated upon at all. I am afraid, gentlemen, that I have rather digressed from the subject of my toast in these remarks I have made to you, but my only excuse is that the subjects I have mentioned are of prime importance to you who are engaged in the great engineering trade of this country. It is not for me to speak of what this Institute owes to your Honorary Secretary, but I desire to couple the name of Mr. James Adamson, your Honorary Secretary, with this toast. I give you the toast "The Institute of Marine Engineers," coupled with the name of Mr. James Adamson.

The Honorary Secretary: Mr. President, Lord Inverclyde, and gentlemen. The possessor of what is termed "a good thing" usually endeavours to hold on to it for what it will bring to himself, and, in the nature of things, his aim is to retain the cream within his own holding for his own purpose. Of such is the commercial business of life or the commercial life of business, whichever way we may like to put it. We have heard to-night, as we have heard on many former occasions, that the Institute of Marine Engineers is a good thing for the country, and we know and acknowledge it to be so, but, unlike that which regulates the principles of commercial life, the mainspring of our vital force and energy is not set for the purpose of enriching or aggrandising the controlling few by means of the labour, or at the expense of the many—which is legitimate, within certain limits, for commerce and trade—but the reverse. We may therefore claim that our aims are distinctly national and altruistic in character, and, being so, we can advocate as worthy of the support of everyone connected with the maritime interest, the Institute, under whose auspices we are met to-night and whose President occupies the place of honour at the celebration of another year's work accomplished since last we met to welcome his predecessor in the chair. Our objects and aims are to encourage the advancement of marine engineering and its exponents, and we seek to enlist in the service all who are in any way interested in that advancement. The wider the area to which our operations are extended, the better for our engineers and the nation; as we take it, the more that technical knowledge and the interchange of experiences are diffused, by so much the more will economy and gain be advanced to the community. It is pleasing to the Council, and I apprehend it is no less pleasing to all who are assembled here, to know that our membership has increased during the last two years especially, and has been increasing in increasing ratio, in addition to which sign of vitality the syllabus of meetings upon which we have entered shows that, on the part of the more energetic portion of our membership, the Institute is flourishing. A year ago at our Annual Banquet, a proposition was shadowed forth by Mr. James Dixon, the Chairman of Lloyd's Register of Shipping—whom we gladly welcome at our board to-night in restored health and strength—which has since taken effect, and we have now the first scholarship of £50 per annum in operation, gained by a Clydeside apprentice, who is now attending the Glasgow University, while the original proposition by the kind liberality of the Committee of Lloyd's, has been doubled in the result, so that we are looking forward to the settlement of another scholarship of like amount next year. This opportunity is taken of expressing our thanks to the Committee for their handsome liberality and encouragement to dilligent young men—engineers—whose circumstances in life do not admit of their otherwise pursuing their studies by attendance at College day classes. The question of having premises in the centre or West of London has been exercising the attention of the Council and is still under consideration, so that I am not in a position to make any official announcement meantime, except to say that, when the time comes and the season is ripe, we look to everyone to do his best to establish a building which we may look upon with pride and satisfaction, very much in the spirit which was referred to by our President in his presidential address in connection with the sentiments of patriotism and the desire to hand down to those who are following as our successors, a legacy which they will not only be proud of, but strain every nerve to maintain and uphold. The exactions of business demand the first consideration of our time and attention, but the minutes devoted from the spare gear of the after time to the business of such Institutions as that we call our own, are well recompensed in the consciousness of a good work done, in the minutes of the proceedings, a volume of which I hold in my hand, and the study of which will well repay every reader who seeks knowledge of matters pertaining to his profession. Our finances have been firmly based on sound principles, and at no time have our liabilities been a cause of anxiety; our annual subscriptions are small, yet our present financial position is good, because we have conducted our affairs on true business maxims, and this we intend to continue to do in the future as in the past. Lord Inverclyde has referred to the fact that in former days, Messrs. Denny built for the Cunard Company, and we hope there is another *Mauretania* of the future which may be built within the limits of the expanding Leven. Reference has been made to efficiency and economy; it is the aim and object of the Institute of Marine Engineers to consider and discuss means for increasing the economy of our steamships among the marine engineers of our nation, that we may be able to back up the efforts of our shipbuilders in building advanced steamers to compete with those of other nations. Lord Inverclyde and speakers at our former dinners have desired engineers to hold back improvements, but as it has been proclaimed to us that shipowners find it hard to make their ships pay, what can the engineer do but design to improve and strive to economise in order that the shipowner may reap that advantage to which he is looking forward? The education of the young engineer is a matter which occupies the attention of the Institute and Council, and I know that the graduates and the young men in connection with the Institute are anxious to learn, and we regret that more apprentices do not come forward to take advantage of the opportunities placed within their reach on all hands. We know there are many engine works throughout the country where the utmost is done to put before apprentices a system of education and a system which, if taken advantage of, would make excellent men, and I apprehend that on such an occasion as this we ought to encourage one another to help forward such movements, so that our apprentices may see and do the right thing in taking advantage of all the opportunities placed before them. It is said there is nothing new under the sun, yet there is something new every day, and many of these new inventions are not confined to those produced by the technically trained, but it is our privilege to consider and discuss the details. Our president in the closing words of his presidential address, referring to competition, considered that we were quite able as a nation to hold our own. Now, if that is the case from a shipbuilder's and engine builder's point of view, I apprehend that we can give a good second to that, and that as engineers we will do our utmost—and are doing our utmost—to back up the improvements made from day to day. It is our duty to take advantage of those improvements and make the best possible use of them. I have to thank Lord Inverclyde for the words he has spoken in connection with the Institute, and I thank you, gentlemen, for the way you have responded to this toast, and in closing, I hope this meeting is but an augury of the future success of the Institute of Marine Engineers, which next year enters upon its majority.

Mr. W. Lawrie (Chairman of Council): Mr. Chairman, my lord and gentlemen. It is my privilege this evening to propose the toast of "Our Guests," and it will presently be your pleasure to give it a reception befitting its importance and the influential character of the gentlemen gathered at the president's table. Successive years have not adversely affected our Annual Dinner, in fact it is an increasing force, and the list of guests shows no decline in any of its essential features. Our members fully appreciate the support and assistance given to the Institute by the presence of so many gentlemen whose influence is felt wherever steamships are known. The aim of the Institute is, as you are all well aware, the advancement of the marine engineer, so that he may bring the fullest knowledge, and the very best scientific knowledge, to bear on his profession, and I think it will be generally admitted that all efforts in that direction must necessarily increase the efficiency of the machinery under his charge, and to that extent assist the shipowner and benefit the mercantile marine of the country generally. Our objects are of more than passing importance, and they deserve the support of every marine engineer in the country, either ashore or afloat, because there never was a time when it was more necessary to be on the alert and to concentrate our energies on the business of our lives. We are reminded of this in many ways. A short time ago I read a newspaper

article, in which the writer demonstrated to his own satisfaction that we, as a nation, were degenerating. In that connection I could not resist the temptation to look back to some of the steamers of my early days of 12 lb. steam pressure, jet condensers and dry-bottomed boilers, saloons aft and a deadweight capacity of about 1,000 tons. Now if we compare steamers of that class with the liner of to-day, it cannot be said that our shipowners, at any rate, have degenerated, in fact it is quite the reverse, and we fully realize the honour conferred on the Institute by the presence of Lord Inverclyde, Sir Thomas Sutherland, Sir James Mackay, Sir Geo. Mackenzie, Mr. James Knott, Mr. Robert Clark, representing in the very highest degree the shipping interests of the country. Lloyd's Registry of Shipping has assisted the Institute very greatly, not only by the presence of its chairman at our Annual Dinner and his initiation of the Scholarship recently founded, but also in the very practical and able support we derive from many of the members of its technical staff in contributing papers to our transactions, rendering incalculable service where it is most required, and I only express the thanks of the members when I acknowledge our indebtedness towards them. From time to time we have also received the assistance of the Board of Trade; Sir Walter Howell and Captain Chalmers have helped us most consistently. We regret that illness has prevented Captain Park being with us and we hope he will soon be restored to his usual health. The policy of the Board is different from that of Lloyd's Registry, and the results are not quite so apparent; however, we welcome all assistance and even moral support is very acceptable. British admirals and naval officers are everywhere welcome guests, and more especially is this so at a gathering of marine engineers. Britishers the world over place reliance on their Navy; they think, and rightly think, that their officers are unequalled for courage and ability. The traditions of the Navy fully justify that confidence, and we may rest assured that if any of our European or other friends care to test the material they are made of, we will find the Navy give a good account of itself. The presence of leading naval architects and marine engineers from the various shipbuilding centres of the country is very satisfactory, although they forget the respect due to the capital of the Empire by taking the lead in all that concerns speed records in the ships they build. They think nothing of creating records, smashing them and setting up fresh ones in a most remarkable manner. The Tyne and the Clyde seem determined that the Thames shall not have a look in. However, we cannot blame them for their activity and we welcome the gentlemen who uphold the fair fame of their country, in spite of quill-driving degeneration. Our past-presidents have, as usual, given a good account of themselves. We can always rely upon their sympathy and support, and, if I may be allowed to say so, I think our first president ought to take a leading place. Even indifferent health cannot keep him away from our annual re-union, and I have known him in his place against the advice of his physician; to-night he looks as buoyant as ever and we hope to have the pleasure of his company and genial presence for many years to come. Finally, we thank every one of the guests who has assisted in making this a record dinner. There are two factors in the success of the dinner which I think, departing for the moment from my subject in proposing this toast, ought to be noted. The first is the popularity of our president, and the second, the organizing skill of the convener of the dinner committee. As a member of that committee, I do not include it in the reckoning, but it is the most remarkable body that ever I have served on. What happens is this. We had a polite note from the convener asking if we would consent to serve on the committee. We replied that we would be pleased to do so, and then—well, that's all, Mr. W. I. Taylor does the rest. Gentlemen, I give you the toast of "Our Guests" and couple with it the names of Admiral Sir C. E. Fremantle and Sir Walter J. Howell.

Admiral Hon. Sir C. E. Fremantle: Mr. Denny, Lord Inverclyde and gentlemen, I do not know why I have been selected for the honour of returning thanks for the guests when there are so many here present, I believe, who are much more competent to do justice to such an important toast. When I was told that I would have this honour I thought I would look in the dictionary and see if I could get something, at all events, which would give me a lead, and the first definition I found of the word "guest" was "a stranger." Now, I objected to that, so I got nothing out of the dictionary, for I cannot consider that the Navy can be a stranger to the Institute of Marine Engineers, and, personally, I may say I have the honour, not only to know several of the marine engineers here present, but I have had the pleasure of accepting their invitation to dinner on a previous occasion. I should not have been very much astonished if the ubiquitous gentleman who has assumed to some extent the position of the ancient mariner had stopped me on my way to this banquet, but if he had done so he would certainly not have asked me anything which is in the ordinary purview of the British taxpayer; he would not have asked me about the Navy, whether building to the half power standard was keeping up to the two-power standard, nor any question on which the body politic is competent to judge, that is, whether our material is sufficient and efficient; but probably he would have asked me whether it was true that one naval officer turned his back on another or refused to shake hands, or if naval officers were on the best of terms. I should have answered him that this was mere gossip. I had the pleasure a few nights ago, on the occasion of the anniversary of Trafalgar, to dine at the Navy Club. We had one guest; we are not so generous as you marine engineers, but that one guest was Mr. Rudyard Kipling. He made us a speech—of course, we always make the guest make a speech—and it was very inspiring, but the whole point of his remarks was that, so far as he knew it, and I think you gentlemen will agree that he knows it pretty well, the spirit of the Navy was all right. I am glad to find that that is also the opinion of the First Lord of the Admiralty, who in a recent speech said we might be living on the morrow of Trafalgar so far as the spirit of the Navy is concerned. That being so, I think if the *matériel* is kept up to the *personnel*, if you build us, as you have done, the very best *matériel*, I have no doubt the Navy will continue to do its duty. I thank you very cordially for having asked me here; I thank you for having given us such a magnificent entertainment, and I can only hope that this great Institution, which has done so much for the Navy and the nation, may continue to prosper, and that the numbers which I see here to-night, and which I believe are unprecedented, will only be a record for this year and not a record for future years.

Sir Walter J. Howell: Mr. President, Mr. Lawrie and gentlemen. After the admirable speech to which we have just listened, I feel that there is little left for me to say in response to this toast. I am sure that I and my fellow-guests are always pleased when we are able to be present at the dinner of this distinguished body of engineers, not only because we are in such complete sympathy with its aims and objects, but because most of us, in some way or another, are grateful for its help. Speaking for the great department I have the honour of representing here to-night, I can say how helpful your Council and your able and courteous secretary, Mr. Adamson, have been to us on many occasions. Gentlemen, I think it is a matter for congratulation that, when the President of the Board of Trade was forming an Advisory Committee under the latest Merchant Shipping Act, he asked this Institute to nominate a representative engineer for appointment upon it. Mr. George Shearer was chosen and he is now a member, and I am sure a very useful member, of that important committee. Well, gentlemen, it is not necessary for me to refer, before such a gathering as this, to the magnificent achievements of the designers and constructors of modern marine engines and boilers. They are admitted and admired by us all. Personally, nothing impresses me more than a visit to the engine-room of one of the big steamships of our mercantile marine, a mercantile marine of which, I believe, we are as proud as we are of that splendid Royal Navy which exists primarily for its protection. But, gentlemen, with regard to our engineers and their subordinates at sea, will you allow me to say one word? I have perhaps unique grounds for knowing, and I say without hesitation that there is *no* body of men more distinguished for their quiet and unostentatious devotion to duty and bravery often under peculiarly trying circumstances. Their gallantry seems to me, indeed, to come to them as part of their ordinary duty, and to be so regarded by them. Only the other day two steamers collided in the North Sea, and this is what happened, and, gentlemen, I am not giving a newspaper report, this information is on sworn testimony:

"When their vessel was rammed most of the crew were asleep in their berths, but in response to a summons

from the captain all came on deck, with the exception of the engineer and three firemen, who determined to remain below in the hope of keeping up steam. These men displayed much bravery, for despite the fact that the ship was sinking, they refused to leave their posts. For some time they worked with the water gradually rising in the engine-room and stokehold, and they only came up after the sea had extinguished the fires."

Now, gentlemen, that appeals to me as bravery of a very fine kind, and I am sure you will agree with me that all honour is due to the men who did their duty in that way. And that is no isolated instance. I am constantly hearing of such conduct and I only give this as an instance, not in any way as an extraordinary event. Gentlemen, at this late period of the evening I will not trespass longer on your patience. I will only add, on behalf of my fellow-guests as well as for myself, how much we thank you for your hospitality this evening. You have given us an excellent dinner, charming music and interesting speeches. We thank Mr. Lawrie for all the kind things he has said about us, we greatly appreciate the cordial manner in which the toast of our health has been received, and we wish the Institute of Marine Engineers all the success and prosperity that it so richly deserves.

Sir William H. White: Lord Inverclyde and gentlemen, it is my privilege to propose to you the health of "The President," Mr. James Denny. There is no need to say much in commendation of this toast. Mr. Denny comes of a good stock; he is a good fellow. The name of Denny will always be honoured in this Institution. He is the third president of that name. Many of us remember when this Institution took its new departure after its first two years of existence, and it was Mr. Peter Denny who helped greatly to forward its progress. Some of us listened to that wonderful speech which he made at what, I think, was the first public dinner of the Institute, when he gave us his reminiscences of shipbuilding and engineering experiences. Later he assisted the Institute in founding the Denny Gold Medal. He was followed some years later by Colonel Denny, and now we have his nephew here, a worthy successor, a man in every respect admirably qualified for the post. It has been my privilege to know Mr. Denny for thirty years. The more I have known him, the better I have liked him and the more completely I have trusted him. You all know that in saying that I say the simple truth. His professional record as a member of that great firm is one of which any man might be proud. Now in the fourth generation of the Denny family, we find that firm, which has always been distinguished, which, Lord Inverclyde told us, fifty-nine years ago was building ships for the Atlantic service of the Cunard Company, still in the van of progress. In the early application of steel for steamers, the Dennys were there; in the application of turbines to the mercantile marine—that wonderful invention due to the genius of Mr. Charles Parsons, whom we have with us to-night—the Dennys again came to the front. In having Mr. James Denny in the chair, the members of this Institute have the greatest hope for the future, they trust its interests to his hands with confidence, they look forward to a year marking many advances made under his direction, they look forward to his presidential year with great expectation. Gentlemen, the health of Mr. James Denny.

The President: Lord Inverclyde and Gentlemen. I have to thank you all exceedingly for the manner in which you have received the flattering remarks that have been made by Sir William White, and I have especially to thank him for the kind things he has said. One can only wish, on such occasions as this, which come more or less to most of us, that one really deserved the complimentary things that are said of us. We all have proud moments in our lives, and there has no doubt been for all of us one particular moment which we can call the proudest moment of our lives. That moment has come to me this evening—and now. I do not think there can be a purer or cleaner gratification for any one than the well-founded belief that we stand well in the estimation of our neighbours and of our friends. Such remarks as have been made, coming as they did from a gentleman of Sir William White's standing and with his great reputation, are especially gratifying and encouraging, but one may be permitted to suggest that Sir William had in view more what a president of your Institute should be than what the president of your Institute actually is. With reference to this Institute, we have had from Mr. Adamson in an eloquent speech an account of the needs it has supplied, the good work it has done, and the excellent position in which it stands financially and numerically; and the best proofs of the success and importance of your Institute are shown by the large company gathered here this evening, and especially by this platform, which is occupied by many gentlemen who have come here specially to do honour to your Institute. It is always invidious to specially mention anyone, but I would call your attention to the fact that you have here gentlemen who are at the head of the largest and most enterprising firms of shipowners in this country and in our colonies. You have also official representatives of that great official body which deals with the trade of our country. The registration societies, Lloyd's and the British Corporation, are also represented, and on the scholastic side we have a past occupant of the chair of naval architecture, and the gentleman also who at present holds that very honourable position. While if we turn to the direct representatives of marine engineering, we have Mr. Parsons, whose achievements in marine engineering during the last few years hardly require mention. It is a matter of regret that there are two absentees who had fully arranged to be present. To-day I unexpectedly met Mr. Andrew Laing, who had come all the way from Newcastle specially to be at this meeting, but, on very urgent grounds, he had been called to Liverpool and was thus unable to be present to-night. Mr. Gracie, head of the Fairfield Company, is ill and could not attend. If these gentlemen had been present we should have had a trio of very distinguished engineers, Mr. Andrew Laing, Mr. Gracie and Mr. Thomas Bell, gentlemen connected with the greatest works in marine engineering of recent or, indeed, of any years, they having been responsible for the engineering side of the *Mauretania* and *Lusitania*, and of H.M.S. *Inflexible* and *Indomitable*. Over and above all this, we have on our platform one whose official position, apart altogether from those personal qualities which all who know him admire, makes him specially welcome, Admiral Oram. Admiral Oram is responsible for the engineering side of His Majesty's Fleet, and that being said, it is not stretching facts to add that he is at the head of the marine engineering profession all over the world. We are very much indebted to these gentlemen for joining us, and from the way in which the toast of "Our Guests" was received it was evident that we, as members of the Institute of Marine Engineers, very much appreciate their presence here this evening. It is an especial compliment coming at a time like this, for those who are actually engaged in our business have, owing to dull trade, to strain every nerve to carry on their undertakings successfully; under these circumstances time is an asset of considerable value, and time has been sacrificed to be with us this evening. For trade, as you all know, is bad, and its very badness has evoked certain suggestions in the hope of bettering it. One—that of co-operation; but as far as one can understand this scheme it means isolation from the rest of trade, both employers and employed, as far as concerns those who are engaged in this scheme. There is another proposal that seems to be in the air—a combination of various interests. Well, we should welcome both these experiments, and not least the latter if it is to be devoted to legitimate aims, if its object is to be more efficient management and reduction of the cost of production, but if it is to be used to maintain, or try to maintain, artificial prices, then it is to be feared that if it has any success at all, that can only be of a temporary character, because all artificial props for our trade must in the long run be for its disadvantage, and might only be another spoke in the wheel of the present much abused capitalist. We all know that the capitalist is regarded with disapproval of a more or less active nature by a not inconsiderable portion of the community; but, after all, is it not possible that there may still be so many righteous men found in all Israel that there may be among the capitalists some to whom the making of money and the squeezing of the last farthing out of their employés are not the first objects, that there may be capitalists engaged in the industry of the country who are endeavouring to use such talents as Providence has given them to the fostering of our trade, so finding employment for large bodies of our people, and thus serving the community to the best of their perhaps mistaken lights? Our present system may not be an ideal one, but it has served, and under it our country has prospered, and has

become the freest and greatest trading community in the world. With regard to this trade of ours, we have the very highest authority for believing that the mystery of the winds had not been solved in ancient days; we are told that they blew where they listed, and no one knew whence they came or whither they went; but now we have changed all that, we do know, more or less, where the winds are coming from, and if to a dangerous extent we hoist storm signals, warning mariners and miners beforehand, so that when dangerous conditions do arise they may have been able to take some precautions. Now, is it not possible that the problem of trade storms or cyclones might be solved? Is it to be supposed that their mystery is so great as to be quite beyond the wit of man? Is there to be no hope that by a more careful investigation than has ever yet been given to this question, we may be able to trace the reasons why trade is good at some times and bad at others? Many reasons are given; some suggest that a good going war would stir up affairs; otherwise that a good harvest will bring good trade; others make the almost impious suggestion that a change of Government would bring about the desired effect, but it should be added that this latter suggestion comes mostly from those who are of the opposition way of thinking. Those in power at present recognise that trade is bad, and are giving out what, when the matter is fairly faced, are really nothing more than charitable doles; they are endeavouring also to create artificial employment, neither of which in the long run can be of permanent advantage to the community. Would it not be better that some of this money should be devoted to investigations that would get at the very root of the matter, so that when bad trade does come we may, in a measure, be warned and prepared for it. The suggestion does not seem at all an impossible one, at least it is very necessary that something more should be attempted than merely tiding over the evil time. We have led the trade of the world in most matters and it would be to the further honour and glory of this country if we could solve this problem of unemployment. I fear I have taken up too much of your time; I thank you very, very cordially. I have already thanked the Institute for the honour done me in electing me as president, and I thank you all very heartily for the welcome you have given me and the manner in which you have received Sir William White's toast.

ELECTRICAL NOTES.

(From our Own Correspondent.)

Dock Cranes.

A FIRM associated with this class of work is that of Messrs. C. & A. Musker, Ltd., of Liverpool, who have recently supplied a travelling gantry crane to Jarrow for the Mercantile Dry Dock Co., Ltd., which from the design appears to be of a neat and useful character. It is capable of lifting a maximum load of 15 tons at a radius of from 35 feet to 53 feet, the lift being 55 feet. The crane is mounted on a high truck with a head room of 10 feet. All the motions of the crane are worked electrically, each end of the hoisting rope being fixed to the barrel which is grooved right and left-handedly. The hoisting speed when carrying 15 tons is 20 feet per minute and the operation is performed by a motor of 30 H.P., running at 575 revolutions. The derricking is by worm and spur machine-cut gear, driving a similar barrel to that of the hoisting gear, the rope being led over movable multiplying sheaves, the time taken to derrick being from a radius of 53 feet to 35 feet only 2½ minutes. The slewing is by means of worm and spur reduction gear, the pinion on the worm shaft engaging with a rack on the top of the pedestal, for revolving the crane. The travelling motor gives a speed of 10 feet per minute with a 15-ton load. Electrical and mechanical brakes are provided on the hoisting and derricking motions and mechanical on the slewing. All the motors are of the multipolar, totally enclosed induction type with slip rings, the controllers being of the tramway type with metallic resistances. The total weight is 105 tons, the crane revolving on a live ring of steel rollers. The operator has full control of all motions and is provided with an enamelled slate switchboard fitted with double pole switch fuses for each motor and switches for lighting, besides the usual ammeter and volt meter. Conduits convey the current, collectors being placed on the leg of the crane.

Electrical Exhibition at Manchester.

This most successful display included several novelties and one calling for mention is the Curtis' turbine in a new form with horizontal motion. Hitherto this machine, as we have described in this column, has been set vertically. In addition to a centrifugal governor, which keeps the speed within from two per cent. of no load to full load an emergency governor is fitted which shuts off the steam if there is a variation of 15 per cent. above the normal. The makers are the well-known firm of British Thomson-Houston Co., of Rugby. On the stand of Electromotor Ltd., was to be found a motor of 20 H.P., which reduces from 850 revolutions to 170 revolutions, and another a 3 H.P. has a range from 1100 revolutions to 50. Messrs. Nalder and Thompson showed an electric tele-thermometer, designed for cold storage warehouses and ships, by which reading can be taken from a centre, such as the officer's cabin, of any number of thermometers placed in different positions. The utility of such an apparatus is obvious we think. A motor-driven winch set comprises a 1½-ton winch built by T. Broadbent & Sons, Huddersfield, the motor developing 38 B.H.P. on half-hour rating at 345 revolutions on a 400-volt. circuit. The frame carries all gearing and is therefore self-contained. The motor is fitted with an electric solenoid brake and the barrel is fitted with a brake worked by foot lever. Messrs. J. P. Hall & Co., Ltd., of Oldham, showed a crane motor of a novel type, fitted with a self-contained magnetic brake, which consists of a number of steel discs fitted on the shaft of the motor so as to have a lateral movement, but no turning movement. By a combination of the working of an electro magnet and springs, the discs are free or pressed against the shaft as energy is put on or taken away from the magnet and a powerful braking effect thus set up.

Lamp Filaments.

With the introduction of the metallic filaments, it becomes interesting to note to what property is due the extra light given by the new lamp. The chief efficiency is due to the higher temperatures at which it is possible to run them. Carbon filaments commence to disintegrate and blacken the globe if run much above 1700 degrees C., but with Tantalum, the running temperature is 2,000 C. and with Tungsten, the principal constituent of Osram Lamps, it is even higher. It must be remembered, however, that the candle-power varies as the twelfth power of the temperature, but the energy supplied varies with the fifth power only. This gives a very great advantage in illuminating power to a lamp that can be run 300 degrees higher in temperature. The light emission of an Osram lamp is given as more than double that of a carbon one. For lighting we require a body that the smallest amount of energy is dissipated at the working temperature; of this the highest percentage possible must be radiated as luminous waves, and here again the metallic filaments score. The full efficiency of the two types of lamps in figures is given as 2·5 watts per candle for an Osram lamp of a 120 volt., 50 c.p. at the temperature of a carbon filament lamp at normal brightness, while the carbon lamp stands at 3·5 watts per candle. It must be remembered the filaments are of different size in the two cases, the temperature being about 2000 C. When curves are plotted at various temperatures for the two types, the metallic shows the greater efficiency, and as we have seen as we go higher, the metallic gains for the reasons stated of being able to withstand excess of temperature.

MR. J. P. DAVIES, the inventor of the water-tube boiler, patent No. 903 of 1907, and of other water-tube boilers, has, we are informed, obtained a declaration from the Chancery Division of the High Court in the action of Davies *v.* The Davies Patent Boiler, Ltd., 1908, D. No. 652, that he is entitled to the patent No. 903 of 1907 free from all claims on the part of the defendant company, and that the company are not entitled to any interest in any invention in relation to boiler or boiler tubes made by Mr. J. P. Davies since the 14th November, 1906, and an injunction restraining the company from setting up any claim thereto.

Industrial and Trade Notes.

THE CLYDE AND SCOTLAND.

(From our Own Correspondent.)

Notable Launches of the Month.—The month of November, so far as it has gone at the time of writing has been signalized by not a few events of note connected with the launching of new vessels and the speed trials of others completed. In respect of launches, enhancing the usual variety, there was consigned to her native element on November 6th, the oil tank steamer *Cadillac* for the Anglo-American Oil Company, by Messrs. Napier & Miller, Old Kilpatrick, a sister ship to the *Tamarac*, completed last year for the same Company. By the same tide which received the *Cadillac*, Messrs. John Brown & Co., launched the new Orient liner *Orsova*, of 12,000 tons; one of three similar vessels being constructed on the Clyde and of other two being constructed at Belfast. The *Orsova*, it may be stated, took about eight months to construct from keel laying to launch, operations having been begun almost simultaneously with those on the two sister ships, the *Otway* building at Fairfield and the one building at the London and Glasgow Company's yard. The *Otway*, as elsewhere noted, was launched from the Fairfield stocks on Saturday, November 21st. The London and Glasgow Co.'s contribution to the Orient fleet will also shortly be sent afloat and it may be taken for granted that the Belfast firm of Messrs. Workman, Clark & Co. will not be long in following suit, although work in their establishment has been more plentiful than in the case of any of the Clyde firms building the new liners. The vessels are intended for the mail service between Australia and this country in accordance with the contract between the Commonwealth Government and the Orient Line. The five steamers, in association with the vessels of the P. & O. Company, the contractors for the British Government mail service to Australia, promise to introduce a material improvement on the present running time on the Australian route. The new service, which is to begin in February, 1910, will have as a European terminal port, Brindisi, instead of Naples as at present. The contractors bind themselves to employ only white labour on board the ships. It is a remarkable illustration of the cost of high speed that the five Orient vessels, steaming $16\frac{1}{2}$ knots, will cost less than one *Lusitania*, steaming 25 knots.

Speed Trials of Notable Ships.—Since penning last month's notes a number of steamships of more than ordinary interest have been tested for speed over the measured mile, and longer distances, on the Firth of Clyde. One of these was the screw steamer *Otaki*, built by Messrs. William Denny & Bros., Dumbarton, for the New Zealand Shipping Company, the machinery in which consists of a combination of reciprocating engines and turbines, being the first merchant vessel so fitted, the only previous vessel being the destroyer *Velox*. Particulars of this interesting departure in marine propulsion are given on page 149. Another vessel tried satisfactorily and handed over to her owners was the twin-screw steamer *Morea*, which Messrs. Barclay, Curle & Co., have built for the P. & O. fleet. She attained an average speed of over 18 knots and is thus one of the speediest, as she is the largest, in the P. & O. Co.'s extensive fleet. She will be followed shortly by the sister ship *Malwa* and some time later by the *Mantua*, both of which are from the stocks of Messrs. Caird & Co., Greenock. A third vessel which was put through her speed tests was the turbine channel steamer *Munich*, built by Messrs. John Brown & Co., for the Great Eastern Railway Co.'s service between Harwich and the Hook of Holland. She is a sister ship to the *Copenhagen*, built by the same builders, and delivered earlier in the year, and like her attained, over an open sea course during a period of six hours, a mean speed of $21\frac{1}{4}$ knots. This test of the vessel's capabilities was considered equivalent to a trial over her service station.

Naval Contracts.—The Clyde has now received not only confirmation of the placing of six of the new torpedo destroyers—three with the Fairfield Company and three with Messrs. John Brown & Co., Clydebank—but the long-anticipated intelligence of contracts for a share of the second-class cruisers, of which five were to be given out. Three of these vessels are to be built on the Clyde, one by the Fairfield Company, one by Messrs. John Brown & Co., Ltd., Clydebank, and one by Messrs. Beardmore & Co., Dalmuir. Of the seven additional torpedo destroyers also, Clyde firms have been favoured with two. One has been placed with Messrs. Denny, of Dumbarton, and the other with the London and Glasgow Shipbuilding Co., Govan. Whatever satisfaction or the reverse may be felt at the distribution of the work amongst firms in other districts the Clyde has thus, in competition, secured a goodly share of the work, although in the case of individual firms the feeling is that more might have been forthcoming. The Dalmuir yard is particularly in need of work, the stocks having been clear for months, and the staff in every direction having been reduced to the minimum.

Tenders for the propelling machinery of the new battleship about to be laid down at Portsmouth and for the large new cruiser to be constructed at Devonport—the former being of 25,000 H.P. and the latter of 43,000 H.P.—were due at Whitehall on the same day, *viz.*, November 24th, and a number of Clydeside firms are offerers. For the turbines of the cruiser, two Clyde and two Tyne firms will be strongly pitted against each other. These are the Clydebank firms of Messrs. John Brown & Co., whose records include the Cunarders *Lusitania* and *Carmania* and the cruiser *Inflexible*; the Fairfield Co., with their experience of the Egyptian Mail steamers *Heliopolis* and *Cairo* and the cruiser *Indomitable*. The two Tyne firms are the Wallsend Slipway Co., and the Parsons Marine Steam Turbine Co., whose experience is scarcely anything less notable.

New Channel Steamers.—It has now been announced that the Fairfield Shipbuilding and Engineering Company are to proceed with the contract, which they were some time ago credited with receiving from the Zeeland Steamship Company, for three new vessels for that Company's service between Queenborough and Flushing. Since the reported placing of the contract some outcry has been made in Dutch papers about preferring to patronise British rather than native shipbuilders. In spite of the fact that as a result of the outcry in the Dutch press a fine of 15,000 florins is to be exacted if the Company persist in having vessels built abroad, it is now stated that this fine will be paid and that the Fairfield Company will proceed with the work. This surely demonstrates that there is good ground for the preference of the Zeeland Steamship Company, and the Fairfield Co., in consequence, may be pardoned for a little elation, although their previous successes in providing vessels for this service may be considered warrant enough for the preference.

Other Orders.—Messrs. Ferguson Brothers, Port Glasgow, early in the month contracted to build and engine a large dredger for a railway company at Buenos Ayres. Messrs. D. & W. Henderson, Meadowside, have contracted to build a new steamer for the Laird Line, Ltd., for their cross-Channel trade. An order for a steamer 120-feet in length has been placed with Messrs. George Brown & Co., Greenock, by Messrs Steel & Bennie, Glasgow, for river trade. A Glasgow firm will supply the machinery. Messrs. William Denny & Bros., Dumbarton, have contracted with Messrs. P. Henderson & Co., Glasgow, to build a cargo steamer of about 8,000 tons deadweight for their service between the Clyde and Liverpool and Bombay. The Clyde Shipbuilding and Engineering Co., Port Glasgow, have received an order to build a steamer of about 300 ft. in length. Messrs. Mackie & Thomson, Ltd., Govan, have obtained an order from New Zealand owners for a twin-screw steamer for passenger and cargo service in the Antipodes, and another order for a passenger steamer for South Australian owners. Messrs. Alley & McLellan, Polmadie, Glasgow, have received an order for three steel barges from foreign owners. The Caledon Shipbuilding Company, Dundee, have received from Messrs. Yeoward Bros., Liverpool, an order for a steamer 2400 tons deadweight and 1800 I.H.P., for service between Liverpool and the Canaries. The Dundee Shipbuilding Co. have received an order from the Banff Steam Shipping Co for a coasting steamer of 350 tons and of the following dimensions: length 117 feet, breadth 22 feet, and depth 9 feet 6 ins.

Petrol-Propelled Torpedo Boat.—Messrs. Yarrow & Co., Scotstoun, have recently completed a petrol-engined torpedo boat, which is the first of its kind to be launched on the Clyde, although the Yarrow firm have done considerable work in this direction at their discarded Poplar works. The dimensions of their first boat of this type, launched in 1906, were, length, 60 feet, beam 9 feet, the engine power being 300 H.P. The present boat is 100 feet in length, with a beam of 13 feet 6 ins. The engines are six-cylinder Napiers of the marine

type developing 600 H.P., driving by means of four propellors. The speed is about 21 knots. The hull, turtle deck and upper deck are built of light steel plating, and the helmsman platform telegraph apparatus, etc., are protected by shields. For coastal defence work these small and fast vessels are destined to play an important part in naval warfare of the future. Their radius of action is considerable, and on account of their lightness a high speed is obtainable. It is calculated that petrol engines of this type give a saving of close upon 50 per cent. over the steam type, both as regards weight and space Messrs. Yarrow & Co. have also recently completed an interesting little vessel, 90 feet in length by 14 feet in breadth, named the *Correo Del Uruguay*. She has been built to the order of the Uruguayan Government and is intended for loading and unloading mails from the steamers that call at the port of Monte Video. She is built of galvanized steel and provided with one set of triple-expansion surface condensing engines and a Yarrow water-tube boiler.

Shipbuilding at Dumbarton.—With the departure of the twin-screw steamer *Otaki*, whose combination of reciprocating and turbine engines yielded such gratifying results on her speed trials on the Firth of Clyde, the attention and energies of Messrs. Denny Bros. and Denny & Co.'s workmen are being concentrated on other work, including the completion of the last two of the five torpedo boats ordered by the Admiralty last year. On the stocks there is a larger ship, but of similar arrangement to the *Otaki*, also two Irish channel steamers for the Burns' fleet. The firm have recently contracted with Messrs. P. Henderson & Co., to build a large cargo-carrying steamer for that Company's trade between Glasgow, Liverpool and Rangoon. While similar in design to the s.s. *Bhamo*, completed last year for the same company, the new vessel will be somewhat larger in carrying capacity, thus amounting to 8,000 tons deadweight. Engines and other machinery will, of course, be supplied by the associated engineering firm of Denny & Co. These contracts, with the fresh order for a torpedo destroyer already noted, provide the major portion of the whole constructional work for the winter. In the neighbouring yard of Messrs. A. McMillan & Sons, prospects of additional work are somewhat brighter, and the firm have recently been taking on hands in various departments. Motor boats are now a common product of the several small yards in Dumbarton devoted to launch and boat-building. The yard of McAlister & Son has the customary number of motor and other yachts laid up for the winter, being altered or repaired for the next Spring season, while there is also a fair amount of new work being proceeded with. At the yard of MacLaren Bros. work is now vigorously proceeding on the order secured some time ago through Messrs. Yarrow & Co., of Scotstoun, for ten launches of 20 feet length for use on warships belonging to the Brazilian Government. The little craft will be carried inboard on davits and while weight is thus kept down to a minimum they will be able little sea-boats with good freeboard and built on the Carvel system with wood of fairly stout scantling. All the boats will be supplied with eight horsepower engines and MacLaren reversible propellers. Trials of the first of these pinnaces have recently been made, and with thirteen passengers on board—seven more than was requisite —the required speed was exceeded. In connection with these motor pinnaces, the same firm are to build a motor tug boat for use in towing the pinnaces.

Condensers for Turbine Sets.—Surface Condensers, as associated with both marine engines and with large power installations on land, have been receiving very close and thorough attention from engineers since the general adoption of steam turbines set in. It will therefore, not surprise readers to learn that Messrs. G. & J. Weir of Cathcart have recently demonstrated in a very striking way the bearing which scientific design has on the results obtainable from high vacuum condensers. At the new turbine power station of the Kensington and Notting Hill Electric Light Company the Weir "Uniflux" condenser recently installed has given almost unprecedentedly high results. With 82 degrees inlet temperature from the cooling tower the vacuum obtained was 28½ inches; the hotwell temperature 95 degrees and the circulating outlet 97 degrees. The condensation rate was 10 lb. per sq. ft. of cooling surface, and the power absorbed by the air and circulating pump, less that due to the tower, was 1½ per cent. of full power. These results, which closely approximate to the theoretical possible, are certain to affect marine practice beneficially when its problems are handled in the light of the data which it is understood Messrs. Weir have secured as the result of a long series of practical experiments.

Clyde Graving Dock Capacity.—Mr. Thomas Mason, chairman of the Clyde Trust, at last meeting of that body referred at length to the present and prospective new works of the Trust. The First Lord of the Admiralty, when visiting Glasgow and the Clyde recently, conveyed to him the impression that orders for great ships were likely to be given only to ports in which they could be thoroughly completed. When the Clyde Trustees built their largest graving dock, they consulted the Government, and they were assured that no ship would ever be of greater dimensions than that dock would be able to accommodate easily. Now, compared with this, the Government themselves were increasing by nearly 20 feet the entrance to their graving docks and giving 10 feet more depth over the sill than the Trustees could afford on the depth of their biggest dock. The result was that when the last battleship was in the graving dock referred to it had to be kept in dock several days until a tide high enough came along and allowed it to be floated over the sill. Shipbuilding was one of the industries which supplied the great community on the banks of the Clyde with their living, and but for this, there would not be the great demand for shipping accommodation which the Trustees could and did supply in their docks. The graving docks had never paid the Trust in proportion to their other work on the river, but they were adjuncts to the carrying on of their business which they could not do without, and which it was their duty to supply. The question to be considered was whether it was not their duty to provide a dock with a depth of water on the sill—and with a length—capable of accommodating the largest battleships the Government contemplated building. It took some time to construct a dock like this and an early decision on the question was most desirable.

Leith New Graving Dock.—Financial questions having now apparently been sufficiently discussed, the Leith Dock Commissioners have agreed to authorise the preparation of plans, specifications and estimates for the construction of a new graving dock leading off the Imperial Dock at that port. A letter was read from the Admiralty officials stating that they had learned from the newspapers of the Commissioners' intention to build a graving dock, and asking to be furnished with plans. As there is still time to consider any suggestions the Admiralty might make the matter has been remitted to the Works Committee.

Dundee as a Naval Depot.—The question of the suitability of Dundee as a submarine depot is engaging the attention of the Admiralty—as stated in last month's notes—and it is believed on good authority that the experts sent to Dundee from Portsmouth and Sheerness to investigate have prepared a report favourable to the proposal. It is suggested that the West Graving Dock should be taken over wholly for the accommodation of submarines, the necessary precautions being taken to secure secrecy. The lock leading to the King William Dock is wide enough to take two submarines abreast, while a further advantage is that they could enter under their own steam. The Admiralty experts are also satisfied that adequate dry docking accommodation is to be found at Dundee, as three submarines could be dry-docked in the West Graving Dock at the one time. The stores and electrical facilities in connection with the docks are also regarded as highly satisfactory, an advantage being the handy situation of a patented slipway that could be used in preparing either submarines or torpedo craft. Hopes are entertained that, in view of the satisfactory nature of the report, the port may also be utilised as a depot for torpedo craft.

THE TYNE.

(From our Own Correspondent.)

The Shipbuilding Outlook.—The slight symptoms of trade revival that were in evidence some weeks ago have proved somewhat delusive, as no further development in the direction of expansion can be noted. If rumour may be trusted, one or two orders have been booked, but shipbuilders are very reticent, and it is next to impossible to obtain authentic particulars of any transactions completed. The recent strikes in the shipbuilding and engineering trades have done apparently irreparable damage in so far as that many shipowners who may contemplate giving out orders appear to

have doubts as to the propriety of placing them in the North-eastern district. The arrangements that have been made, however, for the maintenance of peaceable relations between employers and workmen in the future, ought to dispel such doubts wherever they exist, and impart to prospective investors in shipping greater confidence than ever before existed. Sir Christopher Furness announced in a speech at Hartlepool on the 14th Nov. his intention to give out orders for twenty steamers, twelve of which would be placed in Hartlepool yards, and eight in yards at other centres. Of these latter it is hoped that the Tyne will get a share, and it is considered certain that the Northumberland yard will receive orders for two of the vessels. It would take very much more than this, however, to bring about any appreciable improvement in local trade, and it is devoutly hoped in Jarrow and elsewhere on the river that some proportion of the Government work not yet given out may be secured for this district.

Ship Repairing.—It is stated that two large liners of the Elder-Dempster fleet are expected at the works of Messrs. Swan, Hunter & Wigham Richardson, to undergo extensive overhauls, of hulls and engines. Messrs. Stephenson's large graving dock is at present occupied with a vessel of superior type, which is undergoing rather extensive repairs, and it is understood that prospective contracts will keep the dock engaged for several weeks to come. Parliamentary reference has been recently made to this dock, the information having been given by a high official of the Admiralty, in reply to a question, that there is 29 ft. of water on the cill at spring tides. It is a little singular that the further information was not given that the dock is over 700 ft. long, and capable of accommodating almost any vessel afloat. The Commercial Dry Dock Company, Jarrow, have several vessels under repair, and are likely to be kept busy over the winter. The Smith's Dock Company are also doing well in repair work, having nearly all of their graving docks and pontoons in use, and are also pretty well off for work in their shipbuilding department.

The Palmers' Company.—The establishment of a gun factory at Jarrow in connection with the Palmer shipbuilding works has been recently suggested, and it is probable that the suggestion may in time bear fruit. It has at all events come from a gentleman who is not given to making statements for the mere purpose of adorning a speech, and it is not unreasonable to suppose that something further may be heard of the matter. At present, Jarrow has little more than the Palmer shipbuilding and steel works to depend upon, and it would be a welcome boon if the industry of manufacturing armaments were added. The yard, which is unsurpassed for the possession of appliances for economical production, continues to have a bare appearance, and no more convincing proof of the depth of the shipbuilding depression can be adduced than this. All who desire the success of well-directed enterprise will hope that a different state of matters will soon be presented.

State of Work in other Yards.—At the yard of Messrs. Wood, Skinner & Co. there continues to be a fair amount of work in hand. The s.s. *Stamboul,* which has been built by the firm for Norwegian owners, and is an excellently-equipped cargo boat, is being got ready for sea, beside the yard. At the Neptune Yard, Low Walker, there are two or three vessels in early stages, and several are being fitted out or are otherwise receiving attention in the river. At Messrs. Stephenson's yard there is but a limited amount of new work in hand, and Messrs. Hawthorn, Leslie & Co. are also having several empty berths. The Tyne Shipbuilding Company are able to keep their machinery pretty fully employed, and the Northumberland Yard has still an appearance of comparative prosperity. Messrs. Readhead have a couple of vessels on the stocks, and one at the shearlegs receiving her machinery. They have also vessels lying outside for repairs. Messrs. Eltringham are said to have some orders for fishing vessels, and are likely to be busy for some time.

In the Engine Shops.—There is little change in the condition of affairs at the larger engineering establishments, dulness continuing to be the prevailing feature. The engineering operatives are now finding out how mistaken they were in supposing that half a year's striking could do them any good, but the pity of it is that others besides themselves are suffering the consequences of their folly. In any case work would have been scarce, in view of the state of matters in the shipbuilding industry; but most certainly there would have been more of it if there had been no engineers' strike, or if it had not lasted so long. A movement for the amalgamation of certain engineering firms on the North-east Coast has been initiated, but does not appear to have been favourably entertained on the Tyne. Some leading firms at other centres, however, are evidently desirous of promoting the arrangement, which will doubtless become an established fact by and by. Time will show whether there is anything to be gained by this unlooked-for concentration of forces, but in view of the steady growth of foreign competition, any plan which makes for the cheapening of English products is worth considering.

THE WEAR.

(From our Own Correspondent.)

The Deptford Yard.—An important meeting of the creditors of Sir James Laing & Sons has been held, the outcome of which is that the early opening of the Deptford Yard shipbuilding and brass-founding works has become an event quite within the bounds of probability. The proposal for a reconstruction scheme was received with most encouraging unanimity, and to formulate this plan a committee has been chosen, the constitution of which is bound to have a good effect in increasing public confidence in the future of this great concern. A very hopeful feeling indeed is prevalent on Wearside with reference to the reconstruction scheme, as it is felt that the gentlemen who have the matter in hand will do all that is possible to secure not only the restarting of the yard, but to indicate he best means for achieving satisfactory results in working.

Messrs. Robert Thompson & Sons have received an order for two large cargo boats from a Cardiff firm. This order, with the other work in hand, will keep the yard busy for some time to come. At the Company's Bridge Dockyard a vessel is undergoing a thorough repair, and other repair contracts are expected to be in hand very soon. At the other yards, both above and below the bridge, matters are unchanged since last month.

Engineering.—The state of affairs in the engineering establishments does not show improvement, and in no case has the working staff been very largely increased since the termination of the strike. In the smaller works, also, things are dull, but Messrs. John Lynn & Co. have a fair share of work in their steering gear department. In electrical engineering works business continues to be moderately good. The British Electrical and Manufacturing Company, of Newcastle and London, have acquired convenient premises in Athenæum Street, Sunderland, where they have started a branch of their business. The works are adequately equipped with modern plant, and the management have made ship lighting a speciality. Repairs to and rewindings of armatures are also carried out, and the various electrical accessories required in the fitting of installations are supplied. The venture has, we understand, already secured a fair amount of success, and seems likely to have a prosperous future.

THAMES.

(From our Own Correspondent.)

Port of London Bill.—This measure has been before the Committee of the House, and as we have anticipated, the fact that the river interests are unrepresented was brought prominently forward and an amendment was introduced to remedy this, but it was negatived. On the question of the transfer of the Docks, the Government say the revenue is £809,000 per annum, and that the purchase in Port stock would leave a profit to the Board of Trade of £9,000. The Government consider they have made a good bargain and that this surplus is certain to increase. After agreeing that one of the members appointed by the London County Council shall be representative of labour and various minor alterations, the Bill was reported to the House, which may be taken to mean that it is accepted for good or ill on the general lines that we have previously closely scrutinised. The counties bordering on the Thames tried for representation without avail and traders to fix a limit on dues to be paid, which, we believe, is not settled at the moment. The whole question resolves itself into the fact of the purchase of the Docks and the price to be paid and whether the wharves and river have

received due consideration. It scarcely seems that sufficient consideration has been given to the exact value of the Docks, viewed from up-to-date requirements, but with the Bill practically passed, this point is decided upon and further developments of the matter are soon likely to follow.

Steamship Companies.—With the launch of the *Orsova* for the Orient Co., by Messrs. John Brown & Co., this vessel is the first of five the Company are building to enable them to carry out their contract with the Commonwealth Government. She is 12,000 tons gross register and embodies the most recent design for first-class passenger steamers, including electric lifts and laundries. The company's contract ensures to them a subsidy of £170,000 per annum till 1920, and it is to earn this that the vessels are put into the water. The P. & O. Co. is fitting out the *Malwa* for her maiden voyage to Australia. She leaves Tilbury on January 29th and her sister, the *Morea*, is to leave London on the 4th inst. This vessel has run her trials and has been completed in twelve months. She has been built by Messrs. Barclay, Curle & Co., and is 560 ft long, with a gross tonnage of 11,000 tons. The third of this series is the *Mantua*, to be shortly launched at Greenock. The Shaw, Savill & Albion Co. have recently had built the s.s. *Tainui* at Belfast and the trials have been completed. The vessel is a 10,000 ton ship and recently left on her first voyage to New Zealand. Another London Company, the Atlantic Transport Line has just had launched from Messrs. Harland and Wolff's the *Minnewaska*, a vessel of 14,500 tons, the Company owning the largest ships coming into the Thames. The other three, the *Minnehaha*, the *Minneapolis* and the *Minnetonka* are each 13,500 tons. The new boat is 616 feet long. It is seen, therefore, that next year there will be nine new boats of very large tonnage coming into the river regularly and aggregating 100,000 tons of the most modern and up-to-date steam tonnage, which must be said to look well for the river. An amalgamation is reported by which the future control of the Bucknall Line will be vested in Sir John Ellerman. The arrangement is subject to the approval of the shareholders of the Bucknall Co. The fleet comprises twenty-eight steamers, aggregating 115,000 tons, trading from London to South Africa and from New York and in various other directions. The Royal Mail Co. announces an interim dividend of five per cent. on the preference stock and issues £300,000 4½ per cent, first debentures. The Company's affairs are in a very flourishing condition, the fleet consisting of forty-eight vessels, one of which is the well-known *Asturias*, which will make another voyage in the New Year to Australia.

Seafarers' Service at St. Paul's.—The fifth annual service has been held at St. Paul's in celebration of Trafalgar's Day, and was a great success. The Bishop of London preached and the attendance was representative of every society connected with shipping in London, and included Lord Brassey, Deputy Master of Trinity House, the Shipwrecked Mariners' Society, the National Lifeboat Institution, the Merchant Service Guild, the Shipping Federation, Corporation of Lloyd's and Lloyd's Register of Shipping,while representatives of training ships, officers and seamen completed a most successful assembly.

The Shipwrights' Company.—This Company, under the chairmanship of Sir W. H. White and its Educational Trust Fund has awarded four scholarships at the Royal Naval College, Greenwich, and the Armstrong College, Newcastle, from the funds, which have been supplemented by donations from Lord Pirrie, Sir P. Watts, Sir W. Lewis and Mr. James Dixon.

The Marine Society.—It is interesting to note that the whole of the boys who took part in the record voyage of the *Port Jackson* have been shipped either to the Royal Navy or to the Mercantile Marine and both trips of this vessel have had the same result. Mr. G. H. P. Livesay has presented the Society with a 25-ton sailing tender, which will be employed as an auxiliary to the *Warspite* for short cruises in the estuary of the river, taking twenty to twenty-five boys out at a time.

New Thames Tunnel.—The difficulties of carrying on the free ferry service at Woolwich at certain times are such as to render a tunnel at this point desirable, and a scheme has been brought forward and passed for a footway tunnel at a cost of £112,000 and provided with stairways. The tunnel will be of great service there can be no doubt and it is sure to meet with appreciation.

NORTH-WEST OF ENGLAND.

(*From our Own Correspondent.*)

The Outlook.—In respect to new orders there is practically nothing to report and yet the district has been daily anticipating news of fresh work for the Barrow yard. Nothing is known as yet respecting the orders for the second-class cruisers that are to be ordered, but it is hoped that Barrow will get the order for one of them. It was stated about a month ago that these orders would be placed before Nov. 15th, but perhaps the same thing has occurred as when the destroyers were being tendered for, *viz.*, a revised estimate being required. At the time of writing nothing is known. It is understood that none of the many firms which tendered went in for cutting prices. That disposes of one item that may tend to improve Barrow trade.

The Spanish work is still unplaced, but things are moving and by the end of the year one may learn more. Everything in connection with this big scheme on the part of Spain is being conducted quietly and very little is allowed to leak out, but if signs have anything to do with it then the combination of Armstrong's, Vickers' and Thornycroft's will, in the course of time, have a pretty big order to divide amongst them. It is a fact that many representatives of the firms have visited Spain, probably with a view of inspecting the yards where some of the work, according to Spanish terms, will have to be done. Further than this, one of the British yards was visited by several important Spanish gentlemen, who made a thorough inspection of the plant, etc. That would lead one to believe that matters were shaping. Certainly there is no combination in the world more capable of handling an order of this kind. If it were ten times the size it would be just the same. The extent and resource of such a yard as Vickers' is unique, to say nothing of the other two large firms. Of course, the money side of the transaction will have to be considered and that may mean a delay.

Speaking a short time ago to a gentleman whose position makes any statement he gives important, our correspondent was informed that Vickers' were in for a spell of extreme activity. It would take some time for matters to come into shape, but he had no doubt that in a year from now the firm would be very busy. There are many reasons for believing this forecast. The heads seem busier and more alert and altogether there are indications of a general improvement.

Where the work is to come from is difficult to say at the moment. Of course, there are the two items mentioned above. Then the engineering departments are likely to get more important work. Mr. Asquith has stated that no more "Dreadnoughts" or "Dreadnought" cruisers are to be laid down this year, but this does not stop the Admiralty from obtaining estimates for machinery for a more powerful cruiser of the *Indomitable* class which comes under next year's programme. As a matter of fact, the estimates are in the hands of the powers that be at the present moment. It seems that this new cruiser type is finding favour with the Admiralty, for the machinery for the new vessel is much more powerful, and one may be able to hear of 25 knots being reeled off on a long trial. That brings one to the report of the *Invincible* doing 28¾ knots on her trial. This must be incorrect. It is certainly not believed in engineering circles. Of course, such a speed might be obtained from one land-mark to another, but it would be a 25-knot speed on top of a 3¾-knot tide. The log would show something less than 28¾.

When the two "Dreadnoughts," the Brazilian *San Paulo* and the British *Vanguard*, are launched there will be very little on the stocks at Barrow. There will be an icebreaker for Canada and a small ferry boat for Brazil. It is to be hoped that between now and the end of February there will be several new keels laid.

The "Vanguard."—It will probably be three months before the *Vanguard* is launched. Feb. 22nd is the reported date for launching. The several alterations of the date of launching do not mean that the vessel is behind in construction. As a matter of fact, it is cheaper to keep a vessel on the stocks, for there are no dock dues to pay and the elaborate plant in respect to lifting plates, etc., into position leaves nothing to be desired. It is a matter of congratulation to the heads and a constant source of wonder to the uninitiated

the way this vessel has grown. It is certainly a record for any yard. Work in every department is marvellously forward and nothing is being left to chance. Nothing but an unfortunate labour dispute will delay this vessel, and we are glad to say that nothing threatens at present. Vickers' mean to surprise the world in the building of the *Vanguard*, which, of course, is similar to the *Collingwood*, which was launched by the wife of our Prime Minister early in last month. It is understood that the choice of the lady to perform the ceremony rests in the hands of the Admiralty, so that would seem to dispel the idea of Royalty visiting the town. Barrow would dearly like a Royal visit. They were terribly disappointed by the Prince of Wales when he failed to go and open the Walney Bridge, and it was then suggested that he might attend the launching of the *Vanguard*.

The "San Paulo."—This vessel could be launched on the next spring tide if necessary. She is ready, but she again is saving dock dues and taking no harm, for there is no hurry about her. She is not wanted for over eighteen months yet. She will be launched before the *Vanguard*—probably a month before—and was to have been the first battleship to lie at the new wharf, but she will probably be forestalled by the old *Dreadnought* which was built in 1875 and which is being broken up by the Sheffield firm of Ward's at Barrow. It was at first arranged that the new 150-ton crane should be tested with the old muzzle-loaders of this old bulwark of England, but it has been since decided that the tests will be made with slung chains which are now lying alongside the crane. Nevertheless, as soon as the Buccleuch passage way is ready this old ship will be towed from Ramsden Dock to the new wharf and the guns and armour will be lifted from the vessel. It is rather a dignified start for this crane, and it is only fitting that having taken a hand in the dismantling of one "Dreadnought" it should be the means of helping to fit out a new "Dreadnought" for the same power.

It was stated some time ago that the Argentine Republic had decided in consequence of the neighbouring power of Brazil ordering three "Dreadnoughts" to go in for a big navy themselves. The latest cable is to the effect that Argentine have changed their minds and will not go in for any heavy battleships. The South American Republics are notorious for changing their minds—and Presidents—and they may be expected to go back to the original intention unless, of course, they have learned that Brazil do not mean to keep their vessels, but mean to sell them to the highest bidder. We shall see. One thing is certain. If Brazil keeps these "Dreadnoughts," then any power that is a power in that southern continent will have to follow suit. None of them could tolerate two or three massive "Dreadnoughts," said to be the most powerful afloat, hanging round the coasts and capable of blowing all the ships of the other powers out of the water from such a range that would make it impossible for the more puny vessels to effectively reply. Argentine and Chili would not be able to tolerate the situation despite all agreements that may at present *be said* to exist.

Submarines.—Very few people realize the speed at which submarines are being built for this country, and the Admiralty and builders take very good care that they do not—which is as it should be. There is one thing in connection with these vessels which the Admiralty might be with reason reprimanded for. Other countries which possess submarine vessels have made and are still making provision for the lifting of these vessels, either by the ordinary floating dock or by a sea-going derrick. Germany have constructed an elaborate and extremely useful contrivance which consists of two vessels joined by means of cross girders and which is capable of lifting a submarine, not only from the surface, but when the submarine is submerged. This vessel is capable of putting to sea and its usefulness in case of accident or when repairs are necessary is obvious. What has the British Admiralty done in this department? We understand that floating docks for each naval base for this craft have been under consideration, but got no further. It was suggested that expense was one of the reasons that compelled Lord Tweedmouth to hesitate about placing the orders. That gentleman has gone from the Navy and it is time the successor made a move in this direction. Why should Germany lead?

Floating Crane.—The floating crane, the pontoon for which was built at Barrow and which left Barrow in tow for Montreal, is back. She was, it will be remembered, abandoned in the Atlantic by the tug owing to heavy weather. Then she floated about, a great menace to shipping—a derelict—and then a steam trawler with a highly delighted crew found her. They made sure of her, and with the help of another vessel they took her to Stornaway. It was at first decided to leave her there until the winter was over, but as the weather seemed so mild she was risked in the passage to Barrow, where she arrived, looking none the worse for her experience. She will stay in Barrow now until the winter is passed, when she will be towed across the Atlantic. In the meantime Montreal will have to wait for their 75-ton crane and grain elevator.

Mr. Douglas Vickers.—Barrow is greatly interested in the honour done to Mr. Douglas Vickers, who has been appointed Master Cutler at Sheffield, and who, it is said, will seek party honours as a Unionist and Tariff reformer. His name was once mentioned in connection with Barrow. Mr. Douglas, as he is called at Barrow, is a very smart man. He possesses a marvellous grasp of detail and though not a very constant visitor to the Barrow works he commands considerable respect there. He will make a big mark in this country yet.

The "General Guerrero."—The Mexican troopship-cruiser the *General Guerrero* (which means General of the War Department), built by Vickers', has been for some time lying in the Sloyne Channel in the Mersey. She went there for her guns, etc., which were supplied by a firm in France. She has received them and has undergone tests and sailed for Vera Cruz. There are rumours of further orders for Vickers' from the Mexican Government.

Hæmatite Iron.—The trade in hæmatite iron and steel is only quiet. In the iron trade very little is doing, and a very small number of furnaces are in blast in the district. Prices have rallied owing to certain advices from America, but did not stay up long and there has been a further fall. There is better news from America and a further rise might occur. It all depends upon inquiries that may come to hand from the country directly or *via* the continent. Mixed Bessemer numbers are about 59s. 6d. per ton f.o.b. Warrants are dull. There is very little doing in the market and at present they stand at about 58s. 9d. per ton net cash. Local ore is very dull. The steel trade is better employed, especially in the West Cumberland works, and several good orders for rails have been booked. Messrs. Cammells have received an order for 20,000 tons for the Midland Railway. The Barrow works are still idle and likely to remain so this year, but the new gas blowing and electric plants have been completed and as these will save a great cost in production the works are likely to enter on a period of activity in the new year.

Shipping.—Shipping is still very dull, taking it altogether. The importations of foreign ore are not large, but there is a slight improvement in the shipment of iron and steel. Taking this year, though, it has been very bad indeed, and the decrease as compared with last year for the same periods amounts to no less than 311,000 tons. It is possible that the odd 11,000 will be wiped out by the end of the year.

SOUTHAMPTON.

(*From our Own Correspondent.*)

The London and South-Western Railway Company have written a letter to the Borough Council informing them that they are seeking powers to construct a new graving dock at Woolston, and that they will shortly promote a bill in Parliament for this purpose. The announcement that Woolston is to be the site of the new dock has caused considerable comment, as it was expected that this huge dry dock would be constructed near the present Trafalgar Dry Dock on the river Test. This new dry dock is to be capable of docking vessels of the type now building by Messrs. Harland & Wolff at Belfast. These new vessels are 860 ft. long, and it is expected that they will be using this port within the next three years. The new wet dock is well advanced, and when completed will be capable of berthing vessels of this size, and the Harbour Board are providing a channel 32 ft. deep at low water to this dock. This step was taken when the White Star liners commenced to use the port, and the contractors for the dredging should complete the work this month. The desirability of increasing this depth has already been

publicly discussed. The present depth at high water is approximately 45 ft. The new wet dock will have an area of about 16½ acres, and will probably be completed in about eighteen months hence. Southampton is thus making every provision for the advent of the leviathan vessels, which will no doubt use the port in the near future.

H.M.S. Torpedo Boat Destroyer "Amazon."—During the latter part of last month this vessel was put through her steering, gun, anchor, circle and moderate sea trials. On her speed trial she attained a speed of 33·73 knots. She is now being prepared for handing over to the Portsmouth Division of the Home Fleet.

Messrs. J. I. Thornycroft & Co., Ltd.—H.M. first-class torpedo boats Nos. 31 and 32: No. 31 has successfully completed all her trials, and No. 32 was launched on Nov. 23rd. H.M.S. torpedo boat destroyer *Nubian*: Work is steadily proceeding on this vessel.

S.S. Paso de Obligado.—This vessel is now on passage to the Argentine under her own power. On one of her trial runs she attained a speed of 11 knots. A sister vessel, the s.s. *Paso de la Patria*, was successfully launched on the 27th November. The other three vessels for the same owners are also well advanced. We gave full particulars of these vessels in our November issue.

Messrs. Day, Summers & Co., Ltd., of Northam Ironworks, have booked an order for a new screw steam yacht of 226 tons for Col. Gascoigne, D.S.O., for whom they built the steam yacht *Ulna* of 123 tons in 1902. Last month a boiler was shipped to South America for the Rio de Janeiro Literage Co., for whom they built the tug boat *Emily* in the early part of this year. The slipway machinery for Milford was shipped in November and is now erected.

HULL.

(From our Own Correspondent.)

SINCE my last report appeared nothing of an extraordinary nature in the way of general business moving has taken place, although several important matters have been under discussion of vital interest to the port. The proposition to run a railway from Nottingham to Hull, and to tunnel the Humber between Barton and Hessle has been one of the principal matters discussed, and at a conference convened by the Parliamentary Committee of the Hull Corporation to consider the proposal, representatives of the undermentioned bodies were present:—Hull Chamber of Commerce and Shipping, North-Eastern Railway, Hull and Barnsley Railway, Hull Chamber of Trades and Hull Guardian Society, but after a discussion, which lasted some little time, it is understood no resolution was come to, but in the absence of any undertakings or guarantees from the Nottingham end or from the colliery proprietors that they would join in the project, the conference felt they could take no action in the matter. It is, however, assumed that this particular matter will again come up for discussion at no distant date.

General Business.—General business at the port seems to be fairly active, taking into consideration the season of the year.

BELFAST.

(From our Own Correspondent.)

Messrs. Harland & Wolff.—This firm's shipbuilding operations during the year have been necessarily restricted owing to the extensive operations in connection with the lengthening and improving of three of the slips at the north end of the yard. Despite this fact, when the annual returns are made the Queen's Island firm will be found high up on the list—possibly at the top. Within a few weeks time the White Star Canadian liner *Megantic* will be launched from the south end of the yard, and this, the last launch of the year from the island, will bring the firm's output of new tonnage during 1908 to close on, if not exceeding, 100,000 tons. The *Megantic* is a sister ship of the *Laurentic*, which was put in the water by the same builders and for the same owners in September, but the propelling power of the latter vessel differs from that of the *Megantic* in that it is, as has already been stated in this journal, a combination of reciprocating and turbine machinery, whereas the machinery of the *Megantic* will consist of two sets of reciprocating engines. The owners and builders will thus have an excellent opportunity of comparing the respective merits of the systems; and, it is said, will be to a considerable extent influenced thereby in deciding the method of propelling the leviathan White Star liners *Olympic* and *Titanic*. The completion of the huge crane gantries over the berths above referred to is being pushed forward rapidly with a view to an early commencement on these two vessels. On 12th November Messrs. Harland & Wolff launched a twin-screw steamer of 14,500 gross tonnage, named *Minnewaska*, which they have built to the order of the Atlantic Transport Company. The vessel is 616 ft. long by 65 ft. 6 in. broad, and will be propelled by two sets of quadruple-expansion engines, which are being put on board with the new 150-tons floating crane. The above-mentioned *Laurentic* was the first vessel to have her machinery shipped by this crane, which shows every evidence of proving an important factor in the rapid fitting-out of vessels of big dimensions. Since last month's notes were written Messrs. Harland & Wolff have completed and sent to sea the Elder Dempster liner *Leopoldville*, of which full particulars appeared in a previous issue. The new Red Star liner *Lapland* has been moved to the Musgrave Channel, where her fitting-out is being brought to a finish.

Messrs. Workman, Clark & Co. have not launched any fresh tonnage during the month, but they have still another vessel to put in the water before the close of the year, and when the annual returns have been compiled this firm will also be found to occupy a position high up on the list.

Messrs. Maccoll & Co. have booked an order for a set of engines of about 900 I.H.P. for a steamer to be built by the Dublin Dockyard for the Wigan Coal and Iron Co., Ltd.

JUNIOR ENGINEERS.

WHERE the slotting tool works in a confined space, as in key seating, the tool must project below the tool-box sufficiently for the latter to clear the job; in such instances the tool is made as in Fig. 1. Usually the tool is a flat bar, relieved at A for clearance by about 3° on either side. The cutting angle is limited by similar conditions as apply to the planer tool, with the exception that there is a greater tendency to spring into the metal, and more power is available for driving the tool, owing to the weight of the head. On this account the rake BCD can be made as low as 10° or 15°; the greater the rake the less is the power necessary to bend the shaving, so that where the shaving is short, as in the case of cast iron or brass, the small rake required is not greatly disadvantageous. The clearance angle ECF is obtained by fixing the tool in the box to a 3° slope, although with large tools it may be necessary to grind the front face. The key way having square corners requires the tool to be straight across on its front edge, so that the side cutting angle is merely that due to the side clearance.

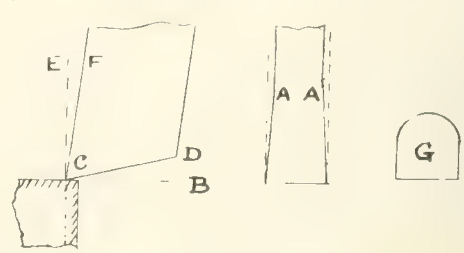


Fig. 1

For similar work, where sharp corners are not required, the tool can be made of half-round bar, as shown at section G, a stronger form of tool is thus obtained with a heavier cut possible.

With a long working stroke both of these tools are liable to spring out of the line of cut, and hence, where the job permits, a short tool is fitted into the side of the tool-box

and clamped by set pins, the tool nose being square or round as necessary, and in the latter case, where side rake can be obtained, the most efficient form is similar to a side planing tool, and of heavy section to avoid chattering.

An advantage which the planer tool possesses over the slotter is that, by fixing the tool box on a hinge, the reversal of the table automatically lifts the tool edge clear of the work, and thus prevents the dulling of the edge during the idle stroke. With the slotting machine this is not so easily arranged for, as obviously a simple swing is not possible; in the larger types of machines, however, the clearing of the tool is provided for by means of either a spring inside the tool box or a mechanical tappet motion.

The flat drill shown in Fig. 2 is almost obsolete, except for the rougher class of work and for large sizes It has several advantages however; it is cheaply and easily made, and for odd sizes it is readily ground to suit any diameter. It consists of a shank of round bar, broadened and flattened at the end sufficient to give the diameter necessary, and as thin as possible consistent with strength. The breadth A should be ground truly cylindrical, and not square, in order to give as much guidance as possible; the point is then thinned away, and the lips ground to enclose an angle of from 100° to 120°, according as the material to be drilled is soft or hard, keeping each lip of the same length and the point perfectly central; this angle is represented by BCD. The opposite sides of each lip are then ground, across their faces, to give side angles, ECF, to form the cutting edges, care being necessary to ensure that the cutting edges originally formed are not touched, and that the line of intersection of the lip faces is at right angles to each cutting edge. With the smaller sizes it is difficult to make the drill accurately, and owing to the loss of time caused by the frequent breaking of the point, this type of drill has been almost entirely superseded by the twist drill. For heavy drilling work, both in the vertical and in the lathe, a drill shown in Fig. 3 is often used. The same precautions are necessary, but instead of

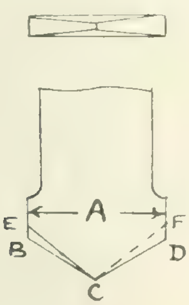


Fig 2

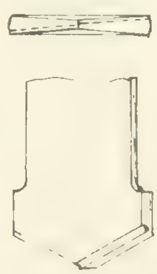


Fig 3

giving a side cutting angle to the lips, the cutting edge is formed by the hollowing out of the face of the lips on opposite sides, and giving only a small clearance angle to the bottom faces. The hollow is more easily formed first, as shown, and the lips then ground to ensure a clean cutting edge. By hollowing the face in this manner the cutting edge is brought close to the point of the drill; so that the efficiency of the drill is increased, by reducing the diameter of the upward projecting cone, which will be seen at the root of drilled holes, where the point of the tool has no cutting effect.

A type of drill sometimes used is one made in the same manner as the plain flat drill, with a small twist given to each lip; by this means a cutting edge is formed instead of merely a scraping one, but the drill is inherently weak, the point is no better, and if it be forced it almost invariably breaks, due to the diameter increasing by the spring of the twisted edges and thus causing seizing.

The pin drill is frequently used for large sizes, in which the lips of Fig. 3 are horizontal, and the point is replaced by a pin. A hole of small diameter is first drilled right through the material, in which the pin is a bearing fit, the large drill is then placed in the spindle socket and without heating can be pushed to its utmost capacity. For still larger holes, above 5 or 6 inches, the drill proper is replaced by a boring bar or disc, in which two or more tools are secured, so that an annular space is bored out round the solid metal, thus considerably reducing the amount of material actually machined, this being common practice with crank cheeks and pump levers.

For quick and accurate work the twist or spiral drill is the tool *par excellence*; this is made in standard sizes up to 3 ins. diameter, with odd sixteenths for tapping or clearing holes. The double-threaded spiral provides room for the drillings to clear themselves from the hole, instead of being powdered and obstructing the drill as with the flat type. The lands or sides of the drill are ground true the full length, and are backed off for the greater part of their width to prevent excessive friction, thus leaving only a narrow strip the full diameter to act as a guidance bearing. To obtain maximum efficiency the point must be ground truly central, and this can only be done with a special grinder attachment. There are fully automatic machines on the market for drill grinding, but as in most instances it is only a surfacing that is required, everything that is necessary can be done by hand. The wheel used is of low-grade emery, and for the smaller sizes runs dry; the drill is rested in a V block, with the end of the shank (drilled with a centre hole) resting in a cone centre. The V block, inclined to the vertical side face of the wheel at a predetermined angle, is placed upon slides so that the drill can be moved both towards the wheel face and across it; by this means the lips are ground at the same angle, a truly central point is obtained, the lips are of equal lengths and the correct angle is readily and permanently fixed. A small clearance angle or backing off is necessary on the lip faces, and this is ground by hand on the periphery of the wheel. The cutting angle enclosed by the lips varies slightly, for different makes of drills, from 100° to 120°, but whatever may be the angle that the drill is made for, this must be adhered to, as otherwise, instead of the cutting edge of the lip being straight, it will have a curvature due to the intersection of the helix by the lip edge, and as this tends to produce irregularity in cutting it is to be avoided. Although the correct cutting angle should vary for different materials, it is more usual to keep a constant angle; as the machine may be irregularly supplied with different classes of work, and the set angle of the grinder would require re-adjustment.

With some makes of drill the flutes are given an increasing twist from the shank to the point, so that the angle should be more acute at the latter end by a few degrees, this being done to maintain a constant central thickness, the regular twist drill having the central portion increased slightly near the shank for stiffness. As it is usual to decrease this thickness of the point by touching either side on the grinder, the advantages of the one type balance those of the other.

The care bestowed on the grinding of the twist drill amply repays itself, for the efficiency of the tool, both as to speed and quality of cut, is greatly affected by an eccentric point or unequal clearance. A handy device for testing whether the lips are of equal length is shown in Fig. 4. This consists

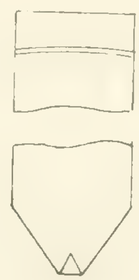


Fig 4

of a piece of sheet metal, having one end bent up to form a centre, on which the shank centre-hole rests. The plate is chalked near the drill point, and the ends of the lips, where they intersect the lands, are drawn across the chalking. If there is a space between the arcs so formed, then the drill is incorrectly ground, and the point is out of centre. If the shank end should be broken, due to any cause, then it is important that the centre hole be accurately re-drilled in the centring machine, as upon this depends the correct grinding of the tool, where the cone centre is used for grinding and testing, although in some cases it is dispensed with, the drill merely resting on the V blocks.

LAUNCHES AND TRIAL TRIPS.

LAUNCHES—English.

Lady Londonderry.—On October 24th, Messrs. S. P. Austin & Son, Ltd. launched from their shipbuilding and repairing establishment at the Wear Dock Yard, Sunderland, the steel screw steamer *Lady Londonderry*, classed 100 A1 in Lloyd's Register, which has been built to the order of S. J. Ditchfield, Esq. She is designed to carry about 1,050 tons deadweight on a light draught, and is specially adapted for the owner's coal trade. Accommodation for the captain and officers is provided in the poop and for engineers in the bridge alongside the machinery. The machinery will be supplied by the North-Eastern Marine Engineering Co., Ltd., with funnel, also, masts to lower for passing under Thames bridges. The deck machinery includes steam windlass by Clarke, Chapman & Co., steam steering gear by Donkin & Co., steam winches by the Seaham Harbour Engine Works, and will be driven from a Blake Multitubular donkey boiler. The construction has been carried out under the superintendence of Mr. J. W. Chilton, of Seaham Harbour, on behalf of the owners, and the vessel was gracefully named by Mrs. Ditchfield.

Arthur.—On October 26th, Messrs. Irvine's Shipbuilding and Dry Docks Co., Ltd., West Hartlepool, launched the handsome steel screw steamer *Arthur*, built for the Rederiaktiebolaget *Lizzie*, of Landskrona. She is of the following dimensions: 230 ft. 6 ins. by 36 ft. by 17 ft. 2 ins., and is built to Lloyd's highest class under special survey. She is built on the improved bulb frame principle instead of hold beams, and a double bottom is fitted throughout on the cellular principle for water ballast, with fore and after-peak tanks arranged as trimming tanks; four large cargo hatches are fitted, and the vessel is replete with all the latest improvements for rapid loading and discharging. A powerful direct steam windlass is fitted forward for the working of the cables and steam steering gear is fitted amidships with screw gear aft. Captain's and officers' accommodation is provided in houses amidships on bridge, and the engineers in after-end of bridge, and crew and firemen in forecastle. The cabins throughout are ventilated on the most approved lines and also heated by steam radiators. The engines are of the triple-expansion type and are being supplied and fitted by Messrs. Richardsons, Westgarth & Co., Ltd., Hartlepool, having cylinders 19 in., 31 in., and 51 in. by 36 in. stroke, steam being supplied by one S.E. boiler, constructed to work at a pressure of 160 lbs. As the vessel left the ways, she was gracefully christened *Arthur* by Mrs. C. H. Ford, wife of the managing owner. Amongst those present were Mr. Chas. H. Ford (managing owner), Mrs. C. A. Forslind, Mrs. Geo. A. Watt, Mr. A. S. Purdon, J.P. and Mr. J. T. Harris.

Navarra.—On October 26th, Messrs. Robert Thompson and Sons, Ltd., launched from their Southwick Yard, a finely modelled cargo and passenger steamer, built for foreign account, and the fourth vessel they have built for the same owners. Her dimensions are: Length, B.P. 250 ft.; breadth, 35 ft., and depth moulded, 26 ft. 4 in.; she will take the highest class in Lloyd's, and is constructed with three complete laid decks, and has six watertight steel bulkheads, also one for cross bunker. Ample water ballast is provided in cellular double bottom and after peak, being sub-divided for trimming purposes. There are four large hatches with derricks arranged for rapid loading and discharging of cargo, worked by five powerful steam winches by Messrs. John Wigham and Son (the main hatch having double winches), steam being supplied from multitubular donkey boiler by Messrs. Thos. Sudron & Co., Ltd., placed in the stokehold. Derrick tables and cross trees are fitted to masts and four large cargo doors in 'tween decks to facilitate rapid working of special trade cargoes. Quick warping steam windlass has been supplied by Messrs. Emerson, Walker & Thompson Bros., Ltd., and steering gear by Messrs. John Rogerson & Co., Ltd. Accommodation for passengers is arranged aft, the saloon being tastefully fitted up in different shades of hardwood, and is specially ventilated to suit a hot climate. Over the saloon there is a large teak house, the fore part being fitted up for the captain, and the after part to be used as a smoke-room, this also forming entrance by a large staircase to the saloon. The officers are provided for in spacious rooms amidships, the engineers and firemen on each side of the engine casing, and the crew's quarters in the forecastle. Large teak chart house is fitted on top of boats deck with connection to pilot bridge. Awnings will be spread fore and aft. The vessel will be installed throughout with electric lighting by Messrs. Siemens Bros. Dynamo Works, Ltd., with special lighting arrangements for loading and discharging. The engines are by Messrs. The North-Eastern Marine Engineering Co., Ltd., having cylinders 18½ in., 30 in., and 49 in., with a stroke of 33 in., steam being supplied by large boilers of 180 lbs. pressure. As the vessel left the ways she was gracefully christened *Navarra* by Miss Joan Thompson, daughter of the chairman of Messrs. Robert Thompson and Sons, Ltd.

Queensgarth.—On October 26th, Sir Raylton Dixon & Co., Ltd., launched from their Cleveland Dockyard, Middlesbrough-on-Tees, the fine steel screw cargo steamer *Queensgarth*, built on the well-known patent Cantilever Framed System with top-side water ballast tanks, to the order of Messrs. Rea Shipping Co., Ltd., of Liverpool, Cardiff and Southampton, which vessel is the third of this type built at the Cleveland Dockyard to fulfil the special requirements of the owners' extensive coal carrying trade. The steamer is being constructed under special survey for British Corporation highest class, her leading dimensions being 283 ft. 6 ins. by 40 ft. 3½ ins. by 23ft. moulded, and she will have a deadweight carrying capacity of nearly 3200 tons on a light draught of water. The bridge will contain the saloon and accommodation for captain and officers and engineers, with chart and wheel-house on top, while the crew will be berthed in forecastle. Water ballast will be carried in cellular double bottom full length of the ship and in fore and aft peaks, as well as in the topside tanks located under the deck at each side of the vessel between the shell and sloping sides of the holds, which are perfectly self-trimming and absolutely free from all obstructions, such as beams, pillars, or web frames. She will have four watertight bulkheads, exceptionally large hatchways, and will be equipped with nine very special and most powerful steam winches, hand and steam-steering gear, etc., and all the latest and most modern loading and unloading appliances. Triple-expansion engines having cylinders 22 in., 35 in. and 59 in. by 39 in. stroke supplied with steam by two large single-ended boilers working at 180 lbs. pressure will be fitted by Messrs. Richardsons, Westgarth & Co., Ltd., Middlesbrough. The hull and engines are being constructed under the supervision of Mr. H. W. L. Shubrook, the owners' superintendent engineer, and Mr. H. W. Hawson.

Werribee.—On October 26th, the Blyth Shipbuilding and Dry Docks Co., Ltd., launched from their shipbuilding and graving dock works the high-class cargo boat *Werribee*, built to the order of Messrs. Huddart, Parker & Co., Proprietary, Ltd., of Melbourne. The leading particulars of the *Werribee* are: Length, 368 feet; beam, 50 feet; depth, moulded, 26 feet 4 ins.; single deck, poop, bridge, and topgallant forecastle. She has been constructed under Lloyd's Special survey to Class 100 A1, and is on the deep frame principle, having clear holds. This vessel has been specially designed for the Australian coal trade. The *Werribee* is rigged as a three-masted schooner, each mast being complete with the latest equipment for quick and economical working of cargo. A special feature on the *Werribee* will be the deck machinery, comprising ten steam winches by Messrs. Lynn of their improved "Liverpool" type and three friction winches by the same makers, powerful steam windlass by Clarke, Chapman and Co., Ltd., and steam-steering gear by Donkin & Co. A complete electric light installation will be carried out by Messrs. Clarke, Chapman & Co., Ltd. The accommodation for captain and officers will be in houses on bridge deck, whilst crew will be berthed in forecastle. Triple-expansion engines of ample power will be supplied and fitted by Messrs. Richardsons, Westgarth & Co., Ltd., Hartlepool. Messrs. Wailes, Dove & Co.'s bitumastic enamel was applied to the lower bunkers and their bitumastic covering to the tank top in boiler space. As the vessel glided down the ways the christening ceremony was gracefully performed by Mrs. Cumming, wife of Mr. Cumming, the superintendent. An adjournment was afterwards made to the offices of the shipbuilders, when the success of the *Werribee*, her owners, and

other toasts were honoured. The hull and machinery have been constructed under the supervision of Mr. Wm. Cumming.

Kapunda.—On October 27th, Messrs. William Gray & Co., Ltd., launched at West Hartlepool the handsome steel screw steamer *Kapunda*, which they have built to the order of the Melbourne Steamship Co., Ltd., Melbourne. The vessel will have a Board of Trade Passenger Certificate and takes the highest class in Lloyd's. Her dimensions are: Length overall, 341 ft.; breadth, 45 ft.; depth, 23 ft. 9 in. She has a full poop, extra long bridge and topgallant forecastle, the bulwarks being carried same height as the bridge, with large doors for taking in cattle and cargo. There will be a handsome and specially lofty dining saloon in house on bridge deck fitted up in light oak, with morocco leather upholstery and party tables, having large skylight overhead with ornamental glass and a music room leading off saloon similarly fitted up, with a handsome piano specially built to stand the Australian climate. The gentlemen's smoke-room, buffet and bar will be fitted up in mahogany, and on the large promenade deck above will be a handsomely furnished ladies' boudoir. There will also be accommodation for a large number of first-class passengers, in addition to stewards and stewardesses in houses on the bridge deck, and for third-class passengers accommodation is made in poop and poop deckhouses, the officers, engineers and crew being housed in the bridge. The galley will be fitted with the latest and up-to-date appliances, including steam cooker, steam boiler, etc., with lift to pantry. There is a very efficient installation of electric lighting, bells, refrigerating machinery and cold chambers. The decks are sheathed with "Kauri" pine, and ventilation has received very careful attention to suit the Australian climate. The hull is built with deep bulb-angle frames, and watertight bulkheads. Cellular double bottom and large after-peak tank for water ballast are available for carrying fresh water to be delivered on deck for stock purposes, a large number of cattle and horses being carried in the 'tween decks; there are large hatchways, with eight steam winches of special design for raising and lowering derricks. The vessel will be schooner rigged, having two masts with derrick tables and outriggers, eight derricks and one large derrick to lift ten tons; steam-steering and hand-screw gear of the latest type will be fitted in deckhouse aft, and the whole of the steering will be manipulated from a wheel on promenade deck; patent direct steam windlass, six lifeboats, stockless anchors and a very complete outfit will be provided for a first-class passenger and cargo steamer. The design has been well thought out for her special trade by the builders in conjunction with Mr. J. H. Hallett, M.I.C.E., of Messrs. J. H. Hallett, Pattison & Co., of Cardiff. She is designed for a high rate of speed, and is supplied by the Central Marine Engine Works of Messrs. Wm. Gray and Co., Ltd., with their well-known type of triple-expansion engines, having cylinders 25 in., 41 in. and 68 in. diameter by 48 in. stroke, and three large steel boilers adapted to work at a pressure of 200 lbs. per square inch, in conjunction with Howden's system of forced draught. The engine room will be replete with all the latest accessories, including Weir's pump and centrifugal circulating pump, "Central" evaporator, Webster's combined feed heater and filter, Worthington's feed and ballast donkey, See's ash ejector, bronze propeller, and a very liberal supply of spare gear. The vessel and machinery have been built under the superintendence of Messrs. J. H. Hallett, Pattison & Co., Cardiff, on behalf of the owners, and the ceremony of naming the steamer *Kapunda* was gracefully performed by Mrs. J. H. Hallett. This is the fourth steamer built by Messrs. William Gray & Co., Ltd., for this well-known firm. Captain J. J. Leask, who commanded the Company's steamer *Monaro*, is to take command and was present at the launch with a few friends and numerous visitors.

Skerne.—On November 5th, the s.s. *Skerne* was launched from the shipbuilding establishment of Messrs. Short Bros., Ltd., of Pallion, Sunderland. Built to the order of C. H. Pile, Esq., of London, she will take Lloyd's highest class and is of the following dimensions:—Length, 214 ft.; breadth, 33 ft., and depth moulded, 13 ft. 10½ in. She is constructed on the deep bulb angle frame principle with poop, raised quarter deck, bridge amidships and topgallant forecastle. Ample water ballast is provided throughout the double bottom and in fore and after peak tanks. Accommodation with saloon handsomely panelled in oak is fitted for captain, officers and engineers in deck-houses on bridge deck, the crew being berthed in forecastle. Three large hatches are arranged with winches and derricks to lift five tons, the pillars at sides of hatches being dispensed with to enable bulky pieces of machinery to be shipped. The vessel has steam windlass, hand-steering gear aft, steam-steering gear amidships driven by controlling shafting from wheelhouse, and has every facility for the speedy and safe handling of vessel and cargo. The propelling machinery will be supplied by Messrs. George Clark, Ltd., of Sunderland, and consists of engines with cylinders 17 in., 28 in. and 46 in. diameter, and a stroke of 30 in., taking steam from two large mutitubular boilers working at 180 lbs. pressure, designed to give the steamer a speed of 10 knots at sea. During construction the vessel has been under the supervision of Mr. H. Hands, of Sunderland. On leaving the ways the vessel was gracefully christened by Miss Edith Short, of Sea View, Sunderland.

Harford.—On November 7th, there was launched from the shipbuilding yard of Messrs. John Readhead & Sons, West Docks, South Shields, a new screw steamer built to the order of Messrs. J. & C. Harrison, Ltd., London, being the second vessel built for this firm by Messrs. John Readhead & Sons. The vessel is of the following dimensions, *viz.*:—Length, 387 ft. over all by 51 ft. 6 in. extreme breadth by 28 ft. 3 in. depth moulded. She has been built to Lloyd's highest class under their special survey, and is of the improved single-deck type, with complete lofty shelter deck above all fore and aft, and has large holds quite clear of all beams and side pillars. A steel centre line bulkhead is fitted all fore and aft in holds for grain division. There are deck-houses for captain and passengers, and also house on top of same for captain's accommodation and chart house, the accommodation for engineers and officers being in steel houses alongside of engine casing; and the crew are berthed in after part of shelter deck. Deck-houses are also fitted aft for steering house and crew's accommodation. She is also fitted with double bottom all fore and aft for water ballast, also with extra large after-peak tank for the same purpose. The arrangements for loading and discharging are of a complete and up-to-date character, the vessel being fitted with eight large steam winches supplied with steam from a donkey boiler of multitubular type, also ten derricks, which are worked from outriggers and tables on the masts, and also one portable steel derrick, for lifting weights up to ten tons. The vessel will be fitted with triple-expansion engines, also constructed by Messrs. John Readhead & Sons, having cylinders 26½ in., 43 in. and 71 in. by 48 in. stroke, supplied with steam from three large steel boilers working at a pressure of 180 lbs. per square inch. Messrs. Wailes, Dove & Co.'s bitumastic enamel was applied to the bunkers and their bitumastic covering to the tank tops in engine and boiler space. The steamer has been superintended during construction by Messrs. E. J. Caiger & Co., of London, on behalf of the owners. As the vessel left the ways she was named the *Harford* by Mrs. John Harrison, of London.

Harvey Scott.—On November 7th, the Blyth Shipbuilding and Dry Docks Co., Ltd., launched from their shipbuilding and graving dock works the fine steel screw steamer *Harvey Scott*, built to the order of Messrs. John O. Scott & Co., Newcastle-upon-Tyne. This vessel, which measures 255 ft. in length with a beam of 36 ft. 9 in., has been constructed under Lloyd's Special Survey to class 100 A1. She is of the raised quarter-deck type, having long bridge and topgallant forecastle. The accommodation for captain, engineers and officers is provided in bridge, whilst crew will be berthed in topgallant forecastle. The *Harvey Scott* is specially adapted for the coal, ore and timber trade, having extra large self-trimming hatches and clear holds, together with the best and latest design of deck machinery for the quick and economical working of the cargo. Triple-expansion engines of good power will be supplied by Messrs. The North-Eastern Marine Engineering Co., Ltd., of Sunderland. As the vessel glided down the ways, the christening ceremony was gracefully performed by Mrs. John O. Scott. An adjournment was afterwards made to the offices of the shipbuilders, when the success of the *Harvey Scott*, her owners, and other toasts were honoured. The hull and machinery have been constructed under the supervision of Mr. Norman Burnett, of Newcastle-upon-Tyne. The vessel is supplied with a Cochran (Annan) donkey boiler.

Matouba.—On November 7th, there was launched from the shipbuilding yard of Mr. William Walker, of Maryport,

a steel screw coasting steamer of the following dimensions :—Length between perpendiculars, 140 ft ; breadth moulded, 26 ft. ; depth moulded, 12 ft. 3 in. She will be fitted with triple-expansion engines built by Messrs. Hutson & Sons, Ltd., Kelvinhaugh Engine Works, Glasgow, having cylinders $13\frac{1}{2}$ in., $21\frac{1}{2}$ in. and $34\frac{1}{2}$ in. by 27 in. stroke, and boiler 13 ft. diameter by 9 ft. 6 in. long by 160 lbs. working pressure. The vessel is built to the highest class at Lloyd's, and was christened the *Matouba* by Miss Irene Walker.

Cataluna.—On November 9th, Messrs. Robert Thompson and Sons, Ltd., launched from their Southwick Yard a finely modelled cargo and passenger steamer, built for foreign account, the fifth vessel they have built for the same owners, and a duplicate of the s.s. *Navarra*, launched a fortnight ago. Her dimensions are : Length, B.P., 250 ft. ; breadth, 35 ft. ; and depth moulded, 26 ft. 4 in. She will take the highest class in Lloyd's, and is constructed with three complete laid decks, and has six water-tight steel bulkheads, also one for cross bunker. Ample water ballast is provided in cellular double bottom and after peak, being sub-divided for trimming purposes. There are four large hatches with derricks arranged for rapid loading and discharging of cargo, worked by five powerful steam winches, by Messrs. John Wigham & Son (the main hatch having double winches), steam being supplied from multitubular donkey boiler, by Messrs. T. Sudron and Co., Ltd., placed in the stokehold. Derrick tables and crosstrees are fitted to masts, and four large cargo doors in 'tween decks to facilitate rapid working of special trade cargoes. Quick-warping steam windlass has been supplied by Messrs. Emerson, Walker & Thompson, Bros., Ltd., and steering gear by Messrs. John Rogerson & Co., Ltd. Accommodation for passengers is arranged aft, the saloon being tastefully fitted up in different shades of hardwood, and is specially ventilated to suit a hot climate. Over the saloon there is a large teak house, the fore part being fitted up for the captain, and the after part to be used as a smoke-room, this also forming entrance by a large staircase to the saloon. The officers are provided for in spacious rooms amidships, the engineers and firemen on each side of the engine casing, and the crew's quarters in the forecastle. A large teak chart house is fitted on top of boats deck with connection to the pilot bridge. Awnings will be spread fore and aft. The vessel will be installed throughout with electric lighting by Messrs. Siemens Bros., Dynamo Works, Ltd., with special lighting arrangements for loading and discharging. The engines are by Messrs. The North-Eastern Marine Engineering Co., Ltd., having cylinders $18\frac{1}{2}$ in., 30 in. and 49 in., with a stroke of 33 in., steam being supplied by large boilers of 180 lbs pressure. As the vessel left the ways she was gracefully christened *Cataluña* by Miss Rachel Thompson, daughter of the chairman of Messrs. Robert Thompson & Sons, Ltd.

Harfleur.—On November 9th, Messrs. William Gray and Co., Ltd., launched at West Hartlepool the handsome steel screw steamer *Harfleur*, which they have built to the order of Messrs. J. & C. Harrison, Ltd., London. She will take the highest class in Lloyd's and is of the following dimensions, *viz.* :—Length overall, 396 ft. 6 in. ; breadth, 51 ft., and depth, 29 ft., with two decks laid, long bridge, poop and topgallant forecastle. The saloon with teak panelling, staterooms, captain's, officers' and engineers' rooms, etc., will be fitted up in houses on the bridge deck and the crew's berths in the forecastle. The hull is built with deep frames, clear holds, cellular double bottom and large aft and fore-peak ballast tanks, nine steam winches, return exhaust and winch condenser, steam steering gear amidships, hand-screw gear aft, patent direct steam windlass, large horizontal multitubular donkey boiler, steel shifting boards, stockless anchors, telescopic masts with fore and aft rig, boats on deck overhead, electric light throughout, and all requirements for a first-class cargo steamer. Triple-expansion engines are being supplied by the Central Marine Engine Works of the builders, having cylinders 26 in., 42 in. and 70 in. with a piston stroke of 48 in., and two large steel boilers for a working pressure of 180 lbs. per square inch. Messrs. Wailes, Dove & Co.'s bitumastic enamel was applied to the bunkers, and their bitumastic covering to the tank tops in engine and boiler spaces. The hull and machinery have been built under the superintendence of Messrs. E. J. Caiger & Co. on behalf of the owners, and the ceremony of naming the steamer *Harfleur* was gracefully performed by Mrs. John Harrison, of London.

Rose of England.—On November 9th, there was launched from the shipyard of Messrs. Cochrane & Sons, shipbuilders, Selby, a handsomely modelled steel screw trawler, the principal dimensions being 120 ft. by 22 ft. by 12 ft. 4 in. moulded. The vessel has been built to the order of Messrs. J. Duncan, Son & Co., of Liverpool, and will be fitted with powerful triple-expansion engines by Messrs. C. D. Holmes & Co., of Hull, and is replete with all the latest improvements for fishing purposes. As the vessel left the ways she was gracefully christened *Rose of England* by Mrs. A. Appleyard, of Hull, after which the company adjourned to the builders' offices, where breakfast was served, and the customary toasts given and responded to.

LAUNCHES—Scotch.

Koombana.—On October 27th, there was launched from the yard of Messrs. Alex. Stephen & Sons, Ltd., Linthouse, the screw steamer *Koombana*, built to the order of the Adelaide Steamship Co., Ltd., of Adelaide, South Australia. Her principal dimensions are 340 ft. between perpendiculars by 48 ft. beam by 32 ft. depth, and she has been constructed under the British Corporation shelter deck rules as a passenger and cargo steamer, carrying first and second-class passengers and a large number of cattle, as well as a considerable amount of general cargo. Her entire arrangement and fittings are all as specially required by the Adelaide Steamship Company.

Her engines, also supplied by the builders, and set of Babcock & Wilcox water tube boilers, will be shipped at Princes Dock. The vessel as she left the ways was named *Koombana* by Mrs. S. Elgar, of Brisbane, wife of one of the Company's superintendents in this country.

Cadillac.—On November 7th, Messrs. Napier & Miller, Ltd., launched from their yard at Old Kilpatrick the steel screw steamer *Cadillac*, the second of two steamers built to the order of the Anglo-American Oil Co., Ltd., to carry about 7,400 tons on a moderate draught. The dimensions of the vessel are :—Length, 385 ft., breadth 51 ft. 6 ins., depth 30 ft. 3 ins. built to Lloyd's highest class for carrying petroleum in bulk. The machinery is being supplied by Messrs. D. Rowan & Co., and consists of triple-expansion engines, $26\frac{1}{2}$ in., 43 in., 72 in., with 51 in. stroke, also three main boilers and a donkey boiler. Messrs. Wailes, Dove & Co.'s bitumastic enamel was applied to the bunkers, engine and boiler-room tanks, cofferdams, peaks, etc., and their bitumastic covering to the tank tops in bunkers and engine and boiler rooms. The vessel is being fitted by the builders with all the latest appliances for the rapid handling of bulk oil cargoes and is electrically lit throughout. While being built, the vessel has been under the direction of Mr. John Morton, the owners' superintendent, assisted by Mr. T. Neish. The naming ceremony was gracefully performed by Mrs. J. H. Usmar of London.

Orsova.—On November 7th, there was launched at Clydebank by Messrs. John Brown & Co., Ltd., the *Orsova*, a twin-screw steamer of approximately 12,000 tons, which they have built for the Australian mail and passenger service of the Orient Line. The principal dimensions are :—Length, 552 ft. ; breadth, 63 ft. 3 in. ; and depth, 46 ft. She is divided by ten water-tight bulkheads. Accommodation is provided for 400 saloon passengers and about 700 third-class. Electric fans will be fitted in all first and second-class cabins. Cool chambers at varied temperatures will be provided for the carriage of meat, fruit, vegetables, etc. The vessel will be fitted with the Marconi signalling apparatus and with all modern appliances for securing the safety and comfort of passengers. The naming ceremony was performed by Mrs. Collins, wife of Captain R. Muirhead Collins, representative in Britain of the Australian Commonwealth.

Otway.—On November 21st, there was launched at Govan by the Fairfield Shipbuilding and Engineering Co., the twin-screw steamer *Otway* for the Australian mail and passenger service of the Orient Steam Navigation Company. The *Otway* is a vessel of about 12,000 tons gross, and her principal dimensions are :—Length, 552 ft. ; breadth, 63 ft. 3 in. ; and depth, 46 ft. She is divided into ten water-tight compartments, and there are seven decks—boat, promenade, shelter, upper, main, lower and orlop. Accommodation is provided for 280 first-class, 115 second-class, and 700 third-class passengers and emigrants. The vessel will be propelled by twin screws, each being driven by an independent set of quadruple-expansion engines balanced on the Yarrow, Schlick and Tweedy system. The high-pressure and the first intermediate pressure cylinders have piston valves and the

The Right Hon. LORD INVERCLYDE.

larger cylinders have ordinary flat slide valves, all worked by the ordinary Stephenson link motion, and controlled by steam reversing gear of the direct-acting type. The shafting is of hydraulic forged Siemens-Martin mild steel. The crank shaft was built at the Fairfield Company's works, and is in four sections. The twin screws have three blades each, and are of bronze, fixed to cast-steel bosses. Steam will be supplied by four double-ended and two single-ended cylindrical boilers designed for a working pressure of 215 lbs. per square inch. Howden's system of forced draught is fitted to all the boilers, the necessary air pressure being sustained by five large motor-driven fans. The vessel was launched and named by Mrs. Fred Green, wife of one of the managers of the Orient Company.

Lydian.—On November 21st, Messrs. The John Duthie Torry Shipbuilding Company, Aberdeen, launched a trawler named *Lydian* of the following dimensions :—Length, 131 ft. ; breadth, 22 ft. 6 in. ; depth, 13 ft. 6 in. She has been built for Mr. Stanley Laycock, Milford Haven, and she will be engined by Messrs. James Abernethy & Co., Aberdeen.

Pelican I.—On November 21st, Messrs. A. Hall & Co. launched a trawler to the order of Messrs. Chant & Paddon, Plymouth, of the following dimensions :—Length, 125 ft. ; breadth, 22 ft. ; and depth, 12 ft. 6 in. She is intended for fishing in the Bay of Biscay, and was named *Pelican I*.

Summersgill.—On November 21st, Messrs. The Dundee Shipbuilding Company launched the steamer *Summersgill* for the Hamilton Shipping Company, Liverpool. The vessel is 118 ft. in length, and has a gross tonnage of 280. Engines are being supplied by Earle's Shipbuilding Company, Hull.

LAUNCH—Irish.

Minnewaska.—On November 12th, the large twin-screw steamer *Minnewaska*, for the London and New York service of the Atlantic Transport line, was successfully launched at Belfast by Messrs. Harland & Wolff, Ltd. The vessel has a gross tonnage of about 14,500 and is 616 ft. long with a breadth of 65 ft. 6 in. She will be propelled by two sets of quadruple-expansion engines of the builders' latest "balanced" type, steam being supplied by four large double-ended boilers and four single-ended boilers fitted with forced draught. Accommodation will be provided for about 330 first-class passengers, and will include dining saloon, lounge, reading-room and smoke-room, all tastefully decorated. Large refrigerated compartments are also provided for the carrying of chilled meat. In addition to the natural ventilation, the vessel will be fitted with a number of electric fans giving efficient artificial ventilation, and she will also have a complete electric light installation.

TRIAL TRIPS.

Waratah.—On October 23rd, the new twin-screw steamer *Waratah*, built by Messrs. Barclay, Curle & Co., Ltd., for Messrs. Wm. Lund & Son's Blue Anchor Line, London to Australia, was delivered to the owners after a very successful trial trip on the Firth of Clyde, during which a speed of 15 knots per hour was maintained throughout an extended trial. The new steamer, which left for her maiden voyage from London on the 6th of November with a full complement of passengers and cargo has been constructed to embody all the qualities desirable for her intended service, of which Messrs. Lund's long experience in this connection has made them expert judges. She is a vessel of 9,400 tons gross register carrying a dead-weight of 10,000 tons and her speed on service will be 13 knots. Twin-screw quadruple-expansion machinery of the builders' standard pattern has been fitted and specially designed to reduce vibration to a minimum. Its efficiency in this respect was amply demonstrated at the trial, when, as has been said, the vessel attained a speed very much in excess of her service requirements. Accommodation for 100 first-class passengers is provided in a style superior to any previous vessel of the fleet, in cabins, which for size and convenience are unapproached in any vessel afloat. In the 'tween decks and aft is accommodation for 600 third-class passengers. The whole of the forward end of the vessel is insulated for the carriage of frozen produce from Australia. It is worthy of note that all the recent steamers of Messrs. Lund's Blue Anchor Line have been produced at the Whiteinch yard of Messrs. Barclay, Curle & Co., Ltd. At the trial, the owners were represented by Mr. F. W. Lund and the builders by their chairman, Mr. James Gilchrist.

Kilnsea.—On October 27th, the cargo steamer *Kilnsea* (of which we gave particulars in our November issue, page 134), built and engined by Mersss. Earle's Shipbuilding and Engineering Co., Ltd., of Hull, for the Sea Steam Shipping Co., Ltd., of Hull, was taken on her trial trip on the Humber, when full speed was maintained, without a hitch of any description, for a period of six hours. During the whole trial, the machinery, steering gear, etc., were put through a severe test, to the complete satisfaction of all concerned. A series of runs were made over the measured mile, showing a mean speed of 11 knots per hour, which gives good promise that the ship will be a fast one of her class when in loaded sea-going condition. The engines were run at a speed of over eighty revolutions per minute without signs of heating, or trouble of any description, thus justifying the additional outlay in extra long connecting rods and large bearing surfaces, which have been adopted in these engines, with a view to good and efficient working and reduced expenditure in upkeep when compared with the ordinary tramp steamer. The keel of the vessel was laid on the 19th June, she was launched on the 14th October, her engines were tried under steam on October 23rd, eight working days after launching, and all completed and trial at sea run on October 27th, eleven days after launching. If the new 100-ton crane now under construction at Earle's yard had been available, the time for completing could have been reduced at least two days.

Petroleine.—On October 27th, the new large oil tank steamer *Petroleine* (of which we gave particulars in our August issue, page 27), built by Messrs. The Tyne Iron Shipbuilding Co., Ltd., of Willington Quay-on-Tyne, for Messrs. The Saxoleine Steamship Co., Ltd. (Messrs. Hunting & Son, Newcastle-on-Tyne, managers), was taken to sea for her trial trip, when the vessel attained a mean speed of over 11½ knots per hour during a series of runs over the measured mile. Immediately after the trial trip, the vessel returned to the Tyne to disembark her visitors and then proceeded straight on her voyage to Philadelphia.

Port Inglis.—On November 4th, the new steel screw steamer, *Port Inglis* (of which we gave particulars in our November issue, page 134), launched by Messrs. Irvine's Shipbuilding and Dry Docks Co., Ltd., and built to the order of Messrs. Furness, Withy & Co., Ltd., proceeded to sea on her trial trip. The ship and engines gave every satisfaction to the owners' representative, Captain Brackenbury, a mean speed of 10½ knots having been attained on the runs. The vessel is supplied with a Cochran (Annan) donkey boiler, with patent seamless furnace.

Paul Paix.—On November 14th, the trial trip of the s.s. *Paul Paix* (of which we gave particulars in our September issue, page 39), built on the new "Isherwood" system by Messrs. R. Craggs & Sons, Ltd., Tees Dockyard, Middlesbrough, for Messrs. Lennard's Carrying Co., Ltd., of Middlesbrough, took place. The vessel in the morning left the Tyne, where, since the launch she has been fitted with quadruple-expansion engines, 21½ in., 30 in., 44 in., 64 in. by 45 in. stroke, three boilers 14 ft. 6 in. by 11 ft. 1½ in., 220 lbs. working pressure, by the North-Eastern Marine Engineering Co., Ltd., of Wallsend, and proceeded to the Tees mouth, where she was joined by a party conveyed there from Middlesbrough by a tug. Amongst those present were Mr. Edward Dawson, J.P., Mr. B. O. Davis, Alderman J. F. Wilson, J.P., Mr. A. W. G. Lennard (representing the owners), Mr. E. Hall Craggs, Mr. P. B. Craggs, and Mr. J. W. Isherwood (representing the builders), Mr. Wier and Mr. Daglish (representing the engineers), Mr. Gravell and Mr. Harkness (representing Bureau Veritas), Mr. W. Cooper (representing Lloyd's), and others. On the run down from the Tyne, the vessel had adjusted compasses, and on the party from Middlesbrough joining she at once proceeded to run her speed trials, and over a four-mile course she averaged a speed of 11·9 knots, the performance of both ship and machinery being all that could be desired. The visitors thoroughly inspected the *Paul Paix*, whose equipment includes two complete oil pumping installations, supplied and fitted by Messrs. Richardsons, Westgarth & Co., Ltd., of Middlesbrough. There are two separate pump rooms, one forward and one aft, with two pumps in each pump room, capable of pumping oil at the rate of 300 tons per hour. A complete installation of electric light has been fitted by Messrs. Clarke, Chapman & Co., Ltd.,

of Gateshead-on-Tyne. The engines and boilers are fitted amidships. The coaling arrangements are very simple, very little trimming being necessary. A cross bunker forward of the boiler room is the most prominent bunker. The double bottom is available for carrying oil fuel or water ballast, and has been fitted in way of the machinery spaces. Lunch was partaken of on board, and the usual toasts were submitted. Mr. E. Hall Craggs, proposing "The Owners, and success to the new vessel," said he had every reason to believe that the owners would soon be congratulating themselves on the fact that they had been the first to contract for a steamer on the new principle. Mr. Edward Dawson, in responding on behalf of the owners, said he was quite sure the vessel would prove a great success. Mr. Gravell, replying to the toast of "The Classification Societies," complimented the builders and Mr. Isherwood on the design and workmanship of the vessel. Mr. B. O. Davis gave the toast of "The Builders," and Mr. Isherwood thanked Mr. Gravell and others for their good wishes. The vessel then left on her maiden voyage, bound for the Black Sea, and the party returned on the tug to Middlesbrough.

Morea.—On November 5th, the *Morea* (of which we gave full particulars in our September issue, page 60), the latest and most important addition to the fleet of the Peninsular and Oriental Steam Navigation Co., Ltd., launched by Messrs. Barclay, Curle & Co., Ltd., at their Clydeholm Shipyard, near Glasgow, ran her official trial cruise on the Firth of Clyde, when she attained a speed of 18 knots. The keel of the vessel was laid on the 6th November, 1907, and being launched on the 15th August, gives a period of nine months and one week occupied in construction, and has been handed over to the owners ready for service in one year from the laying of the keel. A business connection existed between the Peninsular and Oriental Steam Navigation Co. and Messrs. Barclay, Curle & Co. so far back as the year 1872, when the *Zambesi* was built, and was resumed in 1898 with the *Sicilia*; since that time one and sometimes more steamers have, with only a short interval, been under construction at Clydeholm for the P. & O. Company. A large and distinguished company spent an enjoyable day on board while the trials were in progress, amongst these were: Mrs. W. R. Ferguson, wife of the managing director of Messrs. Barclay, Curle & Co., Miss Gilchrist and Miss Taylor. The builders were represented by Mr. Gilchrist, chairman, Mr. Thos. Morton, Mr. Arch. F. Donaldson, Mr. Noel E. Peck, and Mr. Chas. Randolph Smith, and the owners by Mr. C. G. Deane, Mr. H. J. Taylor, Mr. R. Leslie, Mr. Wm. Wills Wilson and Mr. J. Lowe. Sir Thos. Sutherland on the previous day after inspection of the steamer expressed himself as being thoroughly satisfied, and on taking over the vessel personally broke out the house flag of the P. & O. Steam Navigation Co.

BOARD OF TRADE EXAMINATIONS.

October 24th to November 21st, 1908.

Aberdeen.—*1st-class:* John G. Fothergill, Stewart H. Fullerton, James Gray, Charles H. Innes. *2nd-class:* Josiah L. Dickey, R. G. R. Fairweather, George Forbes, James A. Moir, David Morrison.

Barrow.—*1st-class:* Robert Dickey, Tom Dobson. *2nd-class:* Robert Denwood, Thomas H. Vickers.

Belfast.—*1st-class:* Hugh A. Campbell. *2nd-class:* James Bodel.

Cardiff.—*Extra 1st-class:* John W. Henry, Frederic Hovenden. *1st-class:* John L. Arthur, Arthur Cattell, Arthur A. Flyger, Cecil S. Ghest, George H. Griffiths, John Honniball, Harry E. Lace, Nisham Mooses, William O. L. Pawley, Edward Power. *2nd-class:* Frank H. Barnes, Norman S. Coppock, George Cross, Samuel T. Goodman, Kenneth Gunn, George P. Hall, Clement J. Hardyman, Philip Jenkins, George E. Jones, Trevor Marks, Edward H. Pengelly, William Powell, Frederick Rowney, George C. Smart, Frederick G. B. Smith.

Dundee.—*1st-class:* Alexander Berrie, Richard Jones. *2nd-class:* David Christie.

Glasgow.—*Extra 1st-class:* Robert H. Ferguson, James Frew. *1st-class:* Andrew D. Arnott, John Bruce, James G. Davis, Frank Dean, William H. Easson, Harry L. Gray, Alexander Hamilton, Allan W. Henderson, James B. Hill, Hugh M. Kerr, James Lowe, Alexander M'Coig, John Melvin, Thomas J. M'Rae, William M'Millan, Thomas P. Richardson, David Shewan, William A. Smith, Frank Stamp, John Thomson. *2nd-class:* James W. Brown, William G. Brown, George A. Burrowes, Thomas Coyle, John G. Dick, Robert G. Fulcher, George Fullerton, David H. K. Jones, Finlay Mackintosh, John Malcolm, William Malcolm, Christian J. C. Mitchell, Peter G. M'Millan, James Taylor, Alexander Tweedie, Charles M. Wilson.

Greenock.—*1st-class:* James O. Reid, Andrew Walker. *2nd-class:* Albert J. Archibald, George F. Boyle, Joseph Ferguson, Thomas Herbertson, Angus C. McKenzie, Thomas T. M'Rae, Samuel D. Primrose.

Hull.—*Extra 1st-class:* James Shepherd. *1st-class:* Herbert E. Dixon, Frederick A. Green, Harry S. Hurst, Henry R. Wood. *2nd-class:* Frederick Bergwitz, Alfred F. Brown, Robert W. Simms, Gerald J. Stuart.

Leith.—*1st-class:* Ralph W. Bolton, Watson Brown, Henry Edgely, Thomas Henderson, Garnet E. Jenkins, David Marshall, William F. Nicholson, Robert Ramsay, Herbert J. Rees, Andrew L. Renton. *2nd-class:* David Black, William Cadger, William Dickson, Robert Gilmour, David Goodsir, Robert Lawrie, David Mackie, Henry G. Nisbet, William W. Rigg.

London.—*Extra 1st-class:* George W. Black, Albert H. Hacklett, Frank F. Mairet, Erick S. Stanford, Ernest D. Walker. *1st-class:* John Alves, William J. Border, John E. Davies, William B. Dunell, George Gillanders, Joseph Grant, Archibald H. Jeffcoat, Ernest J. Johnson, William Johnston, William H. Larter, John C. Neilson, Horatio M'C. Paterson, William C. Pearce, Horace Rainer, Harold V. Rogers, Herbert J. Shipton, Arthur F. Turvey, Robert Walker, Arthur C. Webb, A. Xanthopoulos. *2nd-class:* Wilfred E. Bailey, Andrew B. Baxter, Walter G. Davies, Charles Drewry, Vincent R. Earnshaw, Sydney J. Esson, David R. Jolly, Percy H. T. Morris, Walter C. Nicolls, W. H. P. Nimmo, Samuel Outen, Gordon M. Roberts, Robert O. Shoebridge, William Steggel, John G. Trehearn, Hugh Turner, William E. Williams, Alexander M. Wilson.

Liverpool.—*Extra 1st-class:* Edward H. Bicknell, Insley Blackmore, Tom Boothman, Annson S. J. Hall, Benjamin H. Pollard, Percy J. Taylor. *1st-class:* James Asquith, Joseph H. Atherton, Wilfred J. Cutbill, Harry L. J. Furlong, W. S. T. Peterkin, Frederick A. D. Spicer, William H. Stone, George W. Strafford. *2nd-class:* Francis J. Blamey, Thomas Brown, Frank H. Cothay, James Ferguson, Thomas S. Frankland, Harrison W. Hill, William Kneale, John Lamb, John Mahon, Frank R. Martin, W. J. M'Caughin, Robert Paterson, John H. Pritchard, Charles H. Riddock, Morris T. Williams, Harold Winstanley.

North Shields.—*Extra 1st-class:* Alfred Beresford, William Dowson, George L. Grainger, David M'Neil, Thomas Smith. *1st-class:* Thomas E. Burnett, Archibald D. Campbell, William Crawford, Ernest J. Fryer, Frederick O. Godtschailk, William Grey, James H. Hunter, Basil W. Little, Harold S. Martin, Samuel P. Meriweather, Thomas H. Moss, Thomas Porter, Lennox F. W. Potts, Ernest W. Rioch, Arthur Salter, Henry Surtees, John B. Wailes. *2nd-class:* William Adamson, Herbert W. Allison, George Andreadis, Leonard Bates, Lowrie Cowell, Thomas W. Harle, Charles Harris, Charles W. Jacobson, Robert James, David Mair, Samuel E. Mendham, Arthur E. Mitchell, John B. Pickering, Tom Prior, Robert H. Pyves, John Shand, Victor Toward.

Plymouth.—*1st-class:* George A. Turnage. *2nd-class:* Charley Hodge.

Southampton.—*1st-class:* Albert Axford, Gustave Brunel, Walter H. Clancy, George Gair, Frank B. Redman. *2nd-class:* Albert Annett, Albert E. Denham, George Dundas, Eduljee M. Eduljee, Archibald Ferguson, Alexander W. Gillespie, Cecil I. Howell, Edward J. Larbalestier, Gavin M'Coll, Ernest Pickering, Charles A. N. Williams, Andrew Wilson.

Sunderland.—*Extra 1st-class:* James Smith. *1st-class:* Joseph Walton.

West Hartlepool.—*Extra 1st-class:* Horatio Thompson. *1st-class:* Charles B. Anderson, Charles H. Balmer, Cuthbert Coulson, Ernest Keady, George P. March, Ernest Reynard, William H. Warren. *2nd-class:* Wilfred C. Agar, John A. Dobson, Charles Elliot, George H. Fletcher, William S. Hull, Arthur Lister, Percy G. Sanderson, William H. Scott, Sydney H. Wilkes.

The Marine Engineer

And Naval Architect.

LONDON, JANUARY 1, 1909.

REVIEW OF THE YEAR.

THE shipbuilding returns for the year just closed indicate that the movements of goods across the seas have been lessening, or have been carried at rates less remunerative to the shipowner than in previous years, thus resulting in a lull in the building of vessels. The industrial progress made by nations which have but recently found an outlet for their energies in shipowning and shipbuilding has considerably affected the condition of both the carrying and the building trades. We have noted the marked progress of Japan in shipbuilding, and the patriotic spirit displayed in connection with this industry and, incidentally, in other directions where rulers and people appear to be working together with a common aim—that being the prosperity of the nation and undivided interests in working to that end. The large increases witnessed during the last decade in dimensions and tonnage of individual vessels have certainly tended to decrease the cost of transit per ton carried, with the further tendency to induce merchants and shippers to enter fresh fields with their goods in competition with others, only rendered possible by reduced cost of carriage. The contrast presented by the illustrations showing the *Comet*, with its interesting reminiscences, and the latest development which has been produced, and of which Henry Bell's boat was the forerunner, is astonishing for even a hundred years of design and work, whether we consider the naval architecture or the marine engineering side of it. There have been several highly interesting problems brought before us during the year. Some of these have advanced a step, others have reached the experimental stage, still others have gone beyond that, finding an opening by means of the capital and enterprise of those who are ever ready to lead in the van of the improving forces which are always at work leavening and preparing for the changes in the aspect of things that are to be and are not yet, for the season is not ripe to bear the fruit. The success of the marine steam turbine has been assured for high-speed vessels; at the same time the progressive builders of the reciprocating engine have not been folding their arms, but have been improving and giving greater attention to details with a view to effecting economies, and have succeeded in doing so. We have thus the beneficial results which accrue from a healthy competition.

The combination of the reciprocating and turbine machinery has entered the field with every appearance of being a successful improvement on either of the types, but it yet remains to be proved by results. The question of electric drive has been occupying the attention of engineers at the meetings of different Societies with a view to secure the best efficiency from the turbine at high-speed revolutions, and from the propeller by means of a lower range of revolutions reduced in transmission by electric motor. Other questions have also been discussed in connection with the introduction of gas plant and the adaptation of the internal combustion engine for marine work with and without electric motors in combination; while a still further proposal, the initial trials of which we have witnessed in the experimental stage, awaits further development before it can enter the range of practical work and discussion—where, however, we hope to find it within the next few months. The necessities of every age produce new features and discoveries; our present needs demand a more economical method of work to produce better results, and more systematic dealing to reduce wastage in every department of life. Evidences are abroad to show that in the department of marine engineering the demand is fully recognised. The enormous increase in the importation of refrigerated produce has been impressed upon public attention of recent years, more especially during the past few months, owing to the International Congress held at Paris, addresses and lectures on the subject. Its importance from the standpoint of the marine engineer has been growing, and he has adapted himself to the requirements with such attention that the carriage of large cargoes, demanding the utmost skill and care in their handling, is seldom otherwise than successfully accomplished. The growing scarcity of wood and the best means of preserving it we commend to the attention of the Arboricultural Societies. In the region of repair work the adoption of the welding process has met with approval and has given satisfaction in cases where, for boiler work especially, it has been the means of saving time and material, as illustrated in our pages during the year. Trials have been made of instruments and appliances for use in the stokehold with the object of improving the conditions of work, saving coal and preventing the emission of smoke. Attempts have been made by railway companies of the large continents to affiliate their interests with those of large steamship companies in order to an arrangement, with other objects, of through rates—a desirable arrangement for merchants and shippers so long as advantage is not taken to create a monopoly detrimental to the public interest. The projected changes in connection with the waterway of the Thames and the docks it feeds, if wisely carried into effect and carefully administered with due regard to economies and the best interests of all concerned, should make London more helpful to the districts whence and to which produce of all kinds is carried. There is room for improvement in connection with inland carriage rates; the establishment of a system of distributing centres would be an impetus

and a boon to many traders, both agricultural and other. Efforts being made in this direction deserve the co-operation of all who are interested, as they merit the approbation of the whole community.

Trade disputes and unemployment have been unhappily very much before us, during the latter portion of the year especially. The presidential addresses delivered to the various societies and the utterances of civic authorities and others have dwelt upon the subjects, referring to the unemployed, the distress and poverty which exist in the centres of population, and the temporary schemes brought forward to meet such cases. Along with these we are reminded of the almost criminal waste and destruction of food which might be avoided by a systematic distribution at rates and in districts which will not affect the general market values.

The facetious remark made by the chairman of the South-Eastern Railway, at the dinner of the Institute of Marine Engineers, reminds us of the progress made in the Navigation of the Air during the year, with the successes, disappointments and failures of the aëronauts. The latest record in the closing month of 1908, is a great advance on the efforts of the earlier part of the year.

The Institute of Metals recently founded has a good work before it, and we wish it every success, as no doubt many problems hitherto unsolved will probably be made clear. In connection with the advancing and retiring waves of trade and commerce and all the elements which work for and against steady progress it has been suggested that an exhaustive and impartial enquiry should be entered upon in order to prepare for either and avoid abnormal conditions as far as possible. It appears to us that there is room for an Institute with the laudable object of investigating all the points of this subject and endeavouring to find a remedy.

THE RECIPROCATING ENGINE.

Much interest has been taken in recent years since the introduction of the steam turbine as to the probable future of the reciprocating engine, and in reviewing the subject one will notice that modern competition and requirements and the aim for strict utility have set their mark on marine engines more drastically perhaps than on any other machine. The observer cannot fail to recognise that the beautiful finish, the variety of fancy in minor detail, the vagaries in design of the various gears and general outlines that characterize the engines built a generation ago, have made place for engines which are marvels of efficiency, cheapness, accurate construction and reliability—in fact, the general practice and details have become so stereotyped and simplified that marine engines of to-day are as uniform as possible short of standardization. An extremely interesting paper on this subject was read by Mr. D. Gibson before the Manchester Association of Engineers, in which he divides ships into four classes, *viz.*:—(1) Fast cross-Channel steamers; (2) fast Atlantic liners from 18 knots upwards; (3) large freight carriers of the intermediate type of liners with speeds of 12 to 18 knots, and power varying from 4,000 to 10,000 h.p. and upwards; and (4) tramps and moderate-sized freight ships of 8 to 12-knot speeds, where the power will not exceed, say, 3,000 h.p. In dealing with the characteristic details of construction of standard reciprocating engines—with which we do not propose to concern ourselves at the moment—Mr. Gibson gave some interesting figures as to weight of engine and boiler per h.p. for varying sizes and types. For 1,800 h.p. triple-expansion engines running 90 revolutions under 180-lb. pressure, the weight of engines, boilers, water and all accessories is 325 tons, or 400 lbs. per i.h.p. For a heavier type of such engine of 3,000 h.p. the weight is 562 tons, or 420 lbs. per i.h.p. Taking another example, such as an up-to-date double set of four-crank triple engines fitted in express Channel steamers, the combined i.h.p. of which is 5,300 at 100 revolutions per minute under 180 lbs. pressure, and the total weight is 600 tons, or 254 lbs. per i.h.p. In dealing with the probable future of the reciprocating engine, as regards the four classes of vessels referred to above, Mr. Gibson has arrived at the following conclusions, with which we cordially agree:—As to classes 1 and 2 everything at the present time points to the fact that for these the steam turbine has come to stay, especially for the highest speeds; but as the designed speed for such vessels may be reduced, there is a limit below which it is not considered advisable to fit turbines. This limit for large vessels is 15 to 16 knots, and for smaller vessels 17 to 18 knots. Up to these limits twin-screw quadruple engines for large ships and twin-screw four-crank triple for cross-Channel steamers give the greater satisfaction as to weight of machinery, non-vibration, neatness of general arrangement, reasonable cost and general efficiency. For class 3 the combination of reciprocating engines with turbines holds promise of coming into general use. This arrangement lends itself to a very good general scheme, particularly for powers of 6,000 i.h.p. and upwards, such as are used in the largest freight steamers and intermediate liners. For class 4, which is the largest class afloat, there is little doubt that the greater proportion will continue to be fitted with the three-crank triple-expansion engine and the remainder with the quadruple-expansion engine. It will be generally recognised that the extreme simplicity, cheapness and economy of the three-crank triple up to 2,000 i.h.p., together with its large single and reasonably efficient propeller, will for some considerable time in the future keep the field against any other system.

A SYSTEM OF CONTROL FOR SHIPYARDS.

We have before us a paper on the above subject, read by Mr. W. J. Wilson before the North-East Coast Institution of Engineers and Shipbuilders, in which the system of control applied to a foreign yard of shipbuilders is fully set out, with samples of the various cards and tables in which all the various operations, materials, etc., are made up at the time of operation, so that all items of expenditure upon any form of ship are fully known within a few days after the ship has left the yard. The author in presenting this paper has done so with diffidence, owing to the diverse views taken on this subject, but he can state that as a record for a works employing some 1,400 men this system had given the best results for this particular establishment where it is instituted. When it was decided to adopt this system the work was divided up into sections, each of which was indicated by a letter, such as S for steelwork, SR for riveting, W woodwork, AM auxiliary machinery, O outfit and rigging, J joiners' and upholsterers' work. Of course each of these letters had subdivisions, such as S1, keel, stem and sternposts; S2, stringers and keelsons; S3, frames, floors and reverse bars; S4, decks, beams and castings; S5, water-tight bulkheads; and S6, shell, and the like for other main headings. The modern card system was adopted with a special card form, which was illustrated. On these cards the order number was first written, then the trade to which it belonged. The labour cost of each job in each department was written in from the time journals, thus practically holding a complete control on each man. For each week the cost to date of each job in each shop could be obtained, and by summing up the total cost in each shop per week was obtained, the results being written on the back of the card. At the end of a month these cards were pinned together, and each job being represented by a letter, the position of each such job could be ascertained. The various trades were summed up under the different letter heads, and the results were noted on the back of the last card. The materials also were not forgotten, as there were special forms comprising the gross weights as weighed by the storekeeper, and also the nett weights as also weighed by the storekeeper when completed. These cards were kept on a loose-leaf file, and each separate batch had an index tag attached, so that any card could be immediately found. All wood was treated in a similar manner, except that for such wood cubic contents were measured and no weight taken. To do the above work required the services of one man, so that all records of work and labour were immediately recognisable for any similar work to be estimated for. Work which had been costly could be inquired into and, where possible, better working methods adopted, whilst a constant watch could be kept on all material.

AUTOGENOUS WELDING.

The developments in the process of Autogenous Welding of metals have extended very rapidly since the successful introduction of the oxy-acetylene blow-pipe jet, and it is now possible to carry out direct welding, without previous heating of thicknesses up to 1 inch and $1\frac{1}{2}$ inch plates and 4 inch to 6 inch in round or rectangular bars, so as not to alter the chemical composition of the metal.

In another direction the oxygen jet has been useful, *viz.*: in cutting metal, as by it, plates $\frac{7}{8}$ to $1\frac{1}{4}$ inches thick can be cut at the rate of 30 feet per hour and pieces 8 inches by 12 inches in diameter right through in four or five minutes.

It must be apparent to every shipowner that these two processes must be of the greatest utility in effecting the repairs of vessels and marine boilers, if only from the standpoint of time occupied in a repair, as it must necessarily follow that if the work can be done *in situ* only a fraction of time will be occupied compared with that involved in cutting the ship about, removing boilers or other machinery, replacing same and reinstating the structure. The daily cost of detention of vessels of large tonnage is sometimes from £160 to £200, and if weeks can be reduced to days the saving is very substantial.

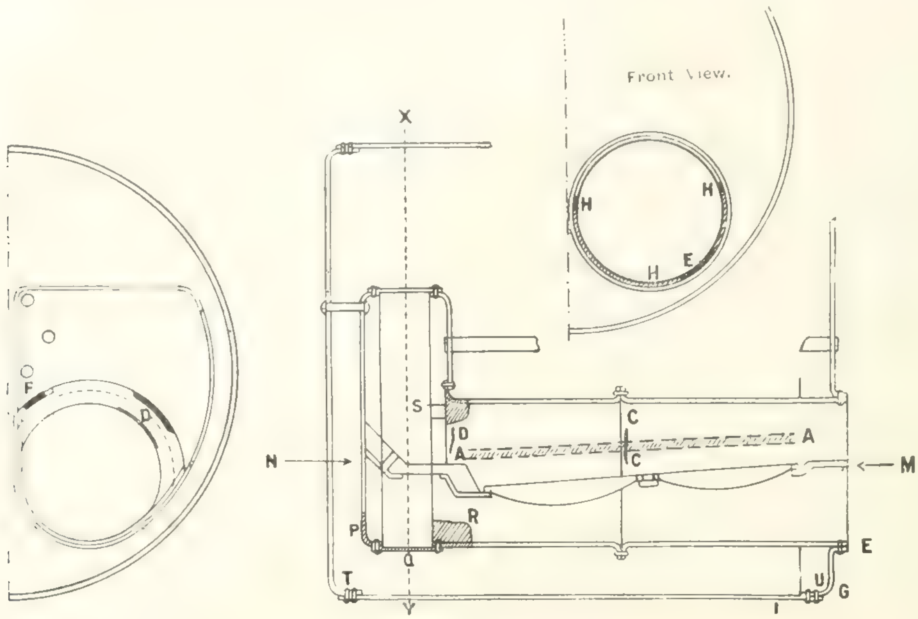
Often defects become apparent, which, if remedied at once, give a much longer life to the structure than if allowed to remain. For example, when the tube plates become worn by corrosion, it is often necessary to remove the boiler, cut out the tube plate and replace it by a new one, hence the repair is often delayed until, on removal, it is decided to substitute a new boiler altogether. It happens most frequently that the hull and the boilers of old vessels do not reach, simultaneously, a degree of wear necessitating their condemnation; by the ordinary processes of repair one can well prolong the life of the hull by two or three years when the boilers are still in good condition, but it is not the same as regards the boilers; when these are worn out while the hull is still seaworthy for some years to come, one is under the necessity of either condemning the vessel entirely, or going to heavy expense for replacing her boilers and substituting for them new ones, which will still be in good condition when the hull has to be condemned, and which will thus be badly utilized.

We have pleasure in illustrating a series of cases where repairs can be made to marine boilers, in order to remove defects due to internal or external corrosions, the wearing away of the riveted edges and of repeated caulking and of the generation of cracks.

Fig. 1 shows three views of the furnace of a boiler of the ordinary type, from which it will be seen that corrosion takes place along the narrow zone from 4 to 8 inches wide at AA, at a height slightly above the level of the grate and throughout the whole length of the furnace, a region where the plate is most strongly heated and where deposits are most easily formed.

Fig. 2 represents the zone of corrosions from 3 to 4 inches wide, extending from end to end and on both

sides, which occurred in the furnaces of the boilers of the mail boat *Cholon* of the "Compagnie des Chargeurs Réunis." There were eighteen furnaces in all and under ordinary circumstances the whole eighteen would have required replacement.



Cross Section at XV

Fig. 1.

Within one month, they were repaired by Autogenous Welding at a cost of £300, an operation which involved a consumption of 10,500 cubic feet of acetylene and an equal quantity of oxygen, and in

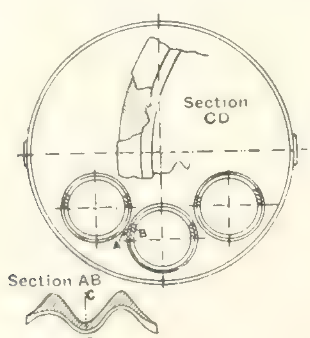


Fig. 2.

the course of the operation, $3\frac{1}{2}$ cwt. of steel were put upon the corrosions.

Fig. 3 illustrates the cracks which form more

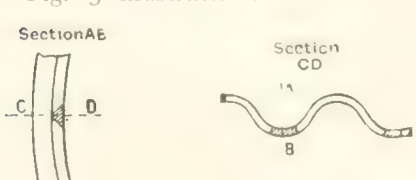


Fig. 3.

Fig. 4.

particularly on the internal corrugations of the furnace; it has been customary in the past to caulk the fissures and put riveted patches upon the crack, but this treatment can only be of a provisional character as the increasing number of cracks soon renders the replacement of the furnace necessary. These cracks can be now completely remedied by autogenous welding and where a number of cracks exist close to each other the whole piece containing such cracks can be cut out and a solid piece substituted.

Figs. 4 and 5 illustrate the kind of patch referred to above, which was found very unsatisfactory and generally leaked in about six months after being put on.

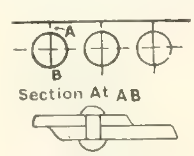


Fig. 5.

Fig. 6.

When patches of this kind are met with in the boilers they can be removed, the crack welded up and the rivet holes stopped by welding.

Fig. 6 illustrates vertical cracks formed in furnaces with deep ribs, and owing to the considerable thickness, which sometimes is as much as $1\frac{1}{4}$ inches, it is advisable

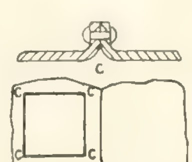


Fig. 7.

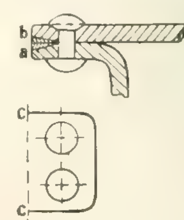


Fig. 8.

to heat the rib by a blow-pipe jet from the interior of the boiler while the welding is being effected from the interior of the furnace.

When vertical cracks occur in plain furnaces, as illustrated in Fig. 1, it may be necessary, after the cracks have been welded up, to take up the rivets which join the two sections of the furnace. This operation sometimes presents great difficulties, owing to the nearness of the furnaces to each other or to the boiler shell.

To overcome this difficulty, a hole can be cut in the crown of the furnace in any position desired, to gain access to the rivets, and after having taken them up, a piece can be welded up to close the hole so made.

The riveted ends of furnaces are greatly strained by expansion and contraction and great reduction in the

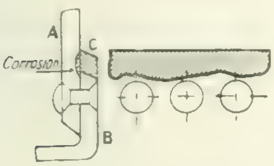


Fig. 9.

Fig. 10.

body of the metal is caused by continual caulking, until naturally further caulking only results in starting the rivets. This feature is illustrated in Fig. 8, and where the plates A and B are equally reduced, the space can be filled up by welding while in the case of the main reduction being in the part A, the best plan is to cut out the parts C C from the plate and insert a new piece.

Fig. 9 illustrates the damage from caulking and corrosion to the reverse flange of the furnace and tube plate flange and shows how this depletion of metal can be made up. Fig. 10 illustrates how in

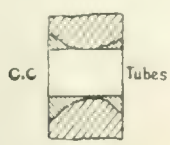


Fig. 11

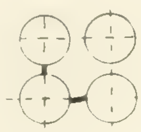


Fig. 12.

the case of an ordinary piece of plate having been welded into a furnace with strengthened ribs, metal is put on in order to form ribs which would properly join to those of the existing furnace. Fig. 11 illustrates the effect of corrosion on the tube plate in the combustion chamber, arising from leakage. This depletion of metal can be rapidly made good by Autogenous welding, and cracks between the tube holes, as illustrated in Fig. 12, can be welded in a similar way. The corrosion illustrated in Fig. 13 is often noticeable in badly-kept boilers and can be treated in the same way as described in the previous instances. The external corrosion that takes place in the lower portion of the boiler, especially in the front plate, owing to leakages at the manholes or caused by damp ashes or bilge water, can be readily dealt with. On the shell, these corrosions are by preference repaired by putting on new metal whilst avoiding any welding in of a new piece, but if on the front plate the corrosions are extensive, a large piece may be cut out and renewed, as illustrated in Fig. 14, the two parts in this case being strongly joined to each other by the furnaces while the welding seams are only short in length. It is often found that the joints of manholes and mudholes become leaky, and this leads to corrosions which in the end make it impossible to keep the joint tight, this difficulty is easy to repair by welding, and we think there can be hardly a single old boiler in existence in which repairs of this kind are not desirable.

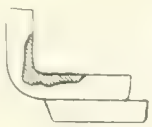


Fig. 13

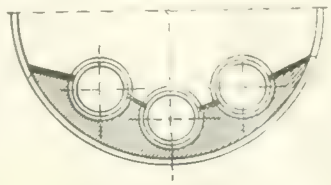


Fig. 14.

When the corrosions are very pronounced, the work can be treated as illustrated in Fig. 15, where the piece A is welded on at B and C, the joint of the cover being made on the surfaces D and E. Some extremely interesting particulars have been compiled by Mons. A. Le Chatelier, a chief engineer of

Fig. 15.

the French Navy, of the actual work that has been carried out in France by this welding process, and we are indebted to the British Autogenous Welding Co., Ltd., of 268, South Lambert Road, London, for furnishing us with the information which the above gentleman has been good enough to compile.

LATE FRANCO-BRITISH EXHIBITION SITE.—After considerable discussion and correspondence on the subject, it appears to be generally approved that the site of the Franco-British Exhibition should be again occupied next summer by an exhibition, the details of which remain to be considered with a view to a general arrangement to meet the probable expectations and tastes of the community at large. Some of the obvious defects of the late Exhibition—sanitary and otherwise—have been commented upon and noted in the right quarter. The object of our present note is to call attention to the use of the lecture hall and advocate that a special feature should be made of it, as we believe that it could be made the medium of conveying highly interesting and valuable information to both young and old. The lectures given in the hall during the late Exhibition were not all advertised in the daily programmes, neither were visitors directed to the hall by posters, while the fact that a strong band of music patrolled past during the delivery of at least one lecture indicated a want of arrangement to suit the occasion. A series of lectures under the auspices of the exhibition authorities in conjunction with the various scientific technical and sociological societies would form a valuable asset in the hands of the management and win the co-operation of all the Societies. The keen interest excited in the late Congress of the Refrigerating Industries and the manifest desirability of discussing *in extenso* many of the questions opened up at the meetings in Paris, seem sufficient reasons for suggesting that this subject might fittingly be followed up at Shepherd's Bush by exhibits and papers.

THE FLEETS OF THE MAIL LINES.

(From our Own Correspondent.)

Legal Decisions.

ONE of the absurdities of the recent Workmen's Compensation Act has been the arbitrary limit placed upon claims by shipmasters for compensation. It has been decided by the legislature in its wisdom that, if a shipmaster have a salary of under two hundred and fifty pounds a year, he is a workman within the meaning of the act, but that if his emolument exceed that sum he is no longer a workman, and cannot claim anything from his employers, in the event of his meeting with an accident in the course of his employment. I need not dwell on the curious position to which we are brought when we see two men engaged on precisely the same work—or even the same man engaged on the same work in the same ship if given a larger salary—being treated in the one case as a workman and in the other as something entirely different. Suffice it to say that there have already been some very delicate questions raised under this provision. One of the most recent was that tried before the judge of the Liverpool County Court at the end of November, when a claim against the owners of the missing sailing ship *Castle Rock* was brought for compensation by Mrs. Jones, widow of the master. The defendants set up a plea that the dead man was not a workman, his total emoluments, as they alleged, being upwards of £250 a year. His actual cash salary was, it was admitted, but £200 per annum. But it was argued that his food and lodgings and the profits of the sales from the slop chest to the crew brought the total up to more than the limit. It has already been settled by the Court of Appeal that not only cash, but also food, must be reckoned in this connection. But to suggest that the value of the captain's apartments must also be brought into the account was an entirely new departure. The learned judge who tried the case did not, however, accept the argument, holding that he could no more reckon the shipmaster's lodgings against him than he could take into account the value of a room provided in an office for the accommodation of a clerk. As regards the profits from the slop chest he did not think they could under any circumstances exceed five pounds a year, and putting the food at £20, there was still a margin, so that the claimant succeeded in her application.

The New White Star Liners.

On the 16th December the keel plate of the new White Star liner *Olympic* was laid by Messrs. Harland & Wolff in their Queen's Island Yard at Belfast. It is now definitely stated that these vessels are to be of a length of 850 ft., and that thus they will necessarily be the two largest vessels as yet constructed or even designed.

The Nord-Deutscher Lloyd.

The last of a famous trio of Nord-Deutscher Lloyd steamships has now been towed to Lemwerder to be scraped. This is the single-screw express steamer *Trave*, built in 1888 at Fairfield. She and her sisters *Aller* and *Saale* were the first vessels to be fitted with triple-expansion engines for the North Atlantic passenger trade. The *Aller* was broken up some five years ago and the *Saale* was transferred to the United States Register after the memorable fire at Hoboken Docks, when she, with others of the fleet, suffered serious damage. It is some years since the *Trave* was employed in the passenger service of the company, for which, according to modern notions, she has long been too small. In 1904 she was reported sold to first one combatant and then to the other in the Russo-Japanese War. But each time the report was contradicted and her sole connection with that historic combat seems to have been that she served a lucrative charter for her owners by bringing home from the Far East Russian prisoners, who during the war had been captured by the Japanese and taken to head-quarters. She had for a long time prior to her departure for Lemwerder been lying more or less dismantled in the Weser.

The Egyptian Mail Steamship Company,

whose service has been interrupted during the early part of the tourist season by financial troubles, now announces that with the new year the sailings of their magnificent steamships *Heliopolis* and *Cairo* will be resumed. The voyage will, as before, be from Marseilles to Alexandria, but there will now be an intermediate call at Messina as well as at Naples.

The Union Company of New Zealand

has been unlucky with its steamship *Hawea*, a vessel of some 1049 tons, built by Messrs. A. McMillan & Co., of Dumbarton, eleven years ago. First of all in the month of August she broke her shaft in the Pacific when on a voyage from Newcastle, New South Wales, to Gisborne, and was adrift for some considerable time before she was towed into Sydney by the Company's steamer *Rakanoa*. During the time she was helpless part of her crew landed at Lord Howe Island. This adventure, however, was soon followed by another and fatal one. At the end of October she left Greymouth for Launceston, Tasmania, and in going out of the harbour she was driven out of her course by a heavy sea and, going ashore, became a total loss.

Then another vessel of the fleet, the *Whangape*, built at Middlesbrough in the year 1900, broke her tail shaft in the neighbourhood of Fiji. Though she was spoken in her disabled condition within a hundred miles of the port of Suva, a tug sent out to bring her in failed to discover her, and at first great anxiety was expressed regarding her fate. She was, however, eventually found and taken to Suva by the steamship *Touna*. At Suva she was tipped till her propeller was brought out of the water. The ship's engineers then removed it, fitted a new tail shaft—which they fortunately had aboard—and replaced the propeller. The job was so successfully carried out that on her return voyage to Auckland, with the cargo of sugar which she had gone out to ship, she was enabled to steam at a speed of over eight knots.

The "Lusitania."

Fogs have, during the later part of November and the earlier part of December, been exceptionally troublesome to Atlantic liners. The *Lusitania*, which should have left New York on the 25th November, was detained there till the following day. She does not seem, however, to have met with much fog on the Atlantic, for her mean speed on the passage was 23½ knots. But off the Irish Coast and up the Channel she was again delayed, and eventually had to anchor off the bar of the Mersey. Thus it was not till the morning of Thursday, the 5th December, that she was enabled to discharge her passengers. Her outward sailing was appointed for Saturday, the 7th December, and she kept her time. The only point on which outward passengers would be able to comment was the fact that, to avoid disturbing the workers till the last moment, she did not go alongside the landing stage to embark her passengers, they being taken out by tenders to her anchorage in the Sloyne. During the forty-eight hours in which she was in the Mersey, the vessel not only had the usual renovations which take place in her state-rooms and public rooms, but also shipped the usual stores and a trifle of some seven thousand tons of coal for her bunkers.

Plymouth

proposes a new and ambitious dock scheme, partly, it is supposed, with a view of attracting the traffic in passengers and mails from the Mersey. The suggestion is to build docks in Wembury Bay outside the Sound, and four or five miles from the port of Plymouth. There is to be a thousand acres of water space with a minimum depth of 35 ft. at low water, rising in places to 48 ft. A couple of 1000 ft. graving docks would also be provided. The space would be enclosed by three sea walls and, if the scheme is carried out, there would be quay space for eight or ten of the largest liners of the present day. Railway accommodation from steamer to quay is, of course, part of the plan, the new dock being connected with the main lines of the Great Western and South-Western Railways by a proposed branch line some five miles in length. Application to Parliament is now to be made to obtain sanction for the proposals.

British Shipowners

are having a bad time in the Russian Courts in regard to the belated appeals from the decisions of Prize Courts as to the legality or otherwise of the capture of our merchantmen during the continuance of the Russo-Japanese War. The chairman of the P. & O. Company has placed on record the experience of that powerful organization with regard to

the seizure of their steamship *Malacca* by a Volunteer Fleet cruiser in the Red Sea. It will be remembered that all that was found aboard the vessel to justify or excuse the taking was certain ammunition bearing the broad arrow. In point of fact, it was King's property going out for the use of His Majesty's forces at Singapore. Nevertheless the *Malacca* was taken through the canal by her captor and so into the Mediterranean where she was in the end liberated. An outcry was made by the P. & O. Company, and by shipowners generally. But no satisfaction was obtained at the time. The Company considered that by missing the voyage and by the disorganization of the arranged sailings of their schedule, they were some £25,000 out of pocket. But there were other serious damages which could not be quite appraised, though they were none the less real for all that. Shippers at Dutch and Belgian ports came to the conclusion that the Red Ensign could not extend due protection to the goods shipped under its tutelage, and accordingly consignments which should have gone by P. & O. vessels were diverted to those of French and German companies. But the Russian Government was unwilling to compensate the Company for the losses they had sustained by the conduct of its servants and the British Foreign Office seemed unable to help its nationals. In the end, after infinite trouble, the P. & O. Company seems to have been glad to accept a sum of about one-third of its actual ascertained loss in full settlement of all obligations on the part of the Russian Government. Sir Thomas Sutherland and those who are with him may remember the way in which this country treated the German steamers which were interfered with during the time of the Boer War, and having in mind the prompt and liberal compensation we made on those occasions may wonder what may be the advantage of sailing under the flag which owns the most powerful Navy in the world.

Now the appeal in the case of the steamship *Oldhamia* has come before the Admiralty Appeal Court at Libau. The *Oldhamia* was burnt by a prize crew from the cruiser *Oleg* on the night of the 18th May, 1905, to prevent her from sailing into the hands of the Japanese. The claim of the British crew for compensation for the loss of their personal belongings was disallowed on a purely technical ground. As regards the cargo—which included kerosene—it was admitted that it was destined for Japan, but alleged that it was intended for purely commercial purposes. The Russians, however, held that as kerosene might be used as fuel for warships it was in fact contraband, and on that ground they justified the seizure. A vague and uncorroborated statement by one of the *Oldhamia's* crew, to the effect that she had guns stowed at the bottom of her hold, was also brought up to support the case against the ship. In the event—as might be expected from the manners and temper of the Russians—the decision was again adverse to the British claim.

The County Council Fleet.

The London County Council has again directed its attention to the disposal of the steamships which it was ill-advised enough to design and build for the traffic of the Thames. The Highways Committee now report that, since they were authorized to do so in the month of February last, they have been endeavouring by advertisement and otherwise to find purchasers for the steamers, and that they have entered into negotiations in several directions but as yet without any real success. The riverside boroughs had urged upon them the desirability of maintaining the service, but the Highways Committee had met them with the financial statement of the working of the vessels. They now had come to the conclusion that the best thing to be done in the interests of the ratepayers—it seems strange, perhaps, to imagine that any County Council ever considers that ratepayers have any interests—was to advertise the boats as for sale by tender. This recommendation was submitted to, and accepted by, the full County Council at its meeting on the 15th December. It may be remarked that, when the tenders are sent in, the tenderers are required to state whether they propose, if successful in their tender, to use the whole or any of the craft they purchase on the Thames as passenger vessels. The little financial statement with which the Highways Committee met the Riverside Boroughs' suggestion was this. The deficiency in the years 1905-6, 1906-7, 1907-8 was £38,131 on piers and £90,185 on steamboats, making a total loss on the experiment of no less than £128,315 net. The management of shipping enterprises, even on rivers, would not seem to be one of those matters which should be touched by municipalities.

The Load Line.

The German Government has been adopting regulations as to load lines similar to those in force in this country. The movement was—as far as my memory goes—initiated by the Hamburg-American Line which some five years ago adopted a voluntary load line based on the British system. What was peculiar to one company has now become general, and what was voluntary in it has now become compulsory on all; and that being so the London Gazette has issued a notice to the effect that the Board of Trade have officially recognised the German load line, and that on proof that German vessels have complied with the regulations of that country they shall not, when in ports of the United Kingdom, be liable to detection for non-compliance with the provisions as to over-loading under the Merchant Shipping Acts. Arrangements such as these tend to avoid international friction and to oil the wheels of commerce, and for that reason business and shipping men should be grateful to Sir Walter Howell, assistant secretary to the Marine Department of the Board of Trade. Sir Walter is, I believe, responsible for the success of the negotiations in this matter, as he has been in regard to similar arrangements in the past.

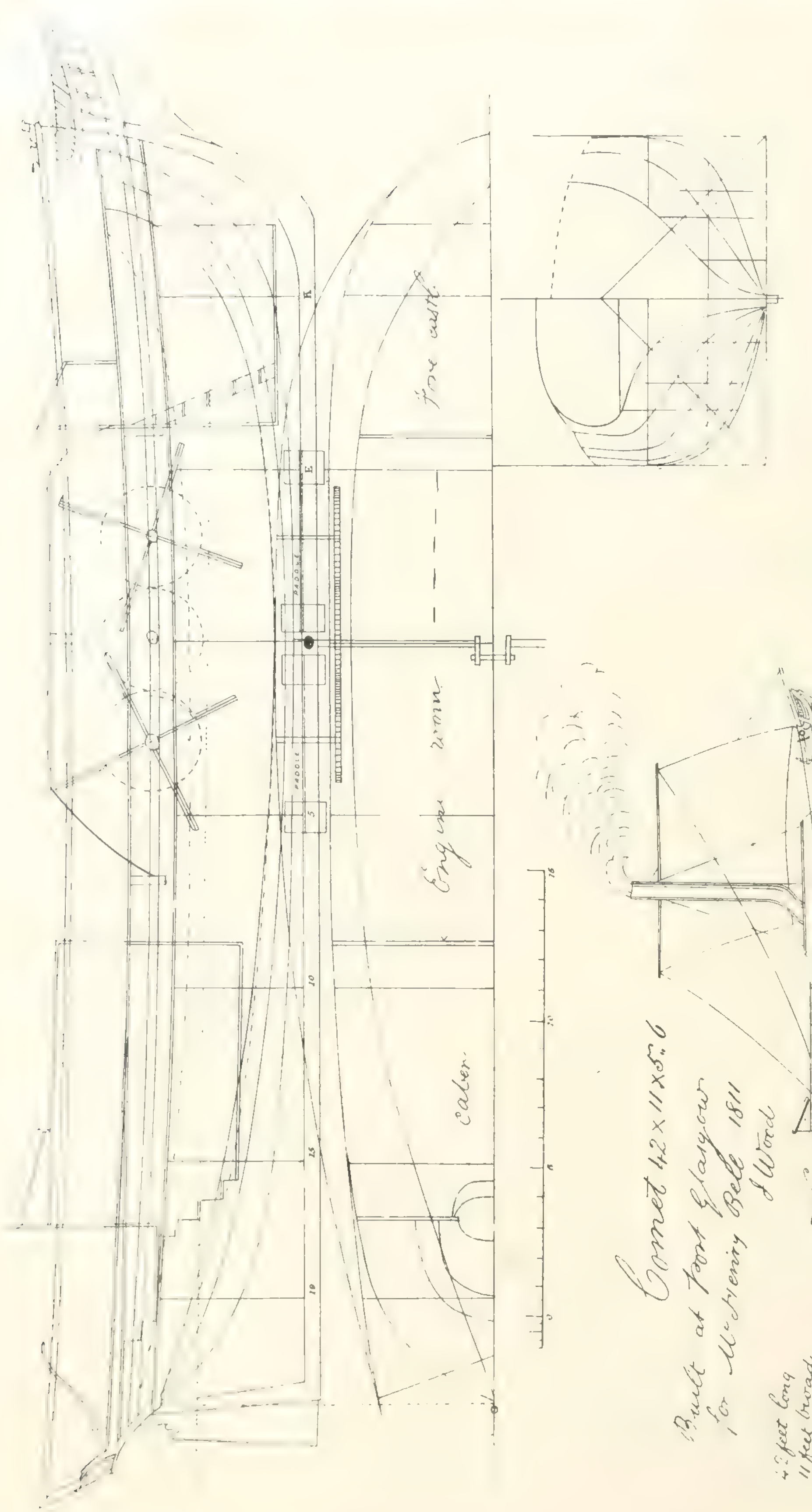
MR. JAMES A. SMITH has placed an order with Messrs. Summers & Payne, Ltd., for a new 26-ton cruising yawl. The yacht is to be built to Lloyd's highest class, and under their special survey.

STEAMSHIP "KOOMBANA," built by Messrs. Alex. Stephen and Sons, Ltd., of Glasgow, for the Adelaide Steamship Co., Ltd., of Adelaide, is coated with *Nomos* Composition. This composition has been used on the whole of the Company's fleet.

MESSRS. DAVIE & HORNE have during the past year made great headway with some of their specialities, which, we understand, are to be fitted in several of the new steamers now building. Their "Davie" Patent Evaporators were fitted in the last new Lund steamer ss. *Waratah*, and the New Zealand Shipping Co.'s ss. *Otaki*.

MESSRS. C. H. CHAPLIN & CO., 12, St. Helen's Place, Bishopsgate Street, London, E.C., have sent us a copy of the price list of their well known Koh-i-noor "Diamond" Self-Lubricating Packings. These packings were first placed on the market about twenty-five years ago, and speedily made a good reputation for themselves for refrigerators, feed pumps, intermediate and low pressure steam glands, stern glands, and hydraulic rams. They are extensively used by the leading steamship companies, railways, gasworks, and other large users of steam and hydraulic power in the kingdom. Messrs. C. H. Chaplin & Co. are contractors to H.M. Government, and also do a large export trade, for which their manufactures are especially suited, as they are not affected by any variations of climate, nor by damp, so can be depended upon to keep in good condition in any part of the world.

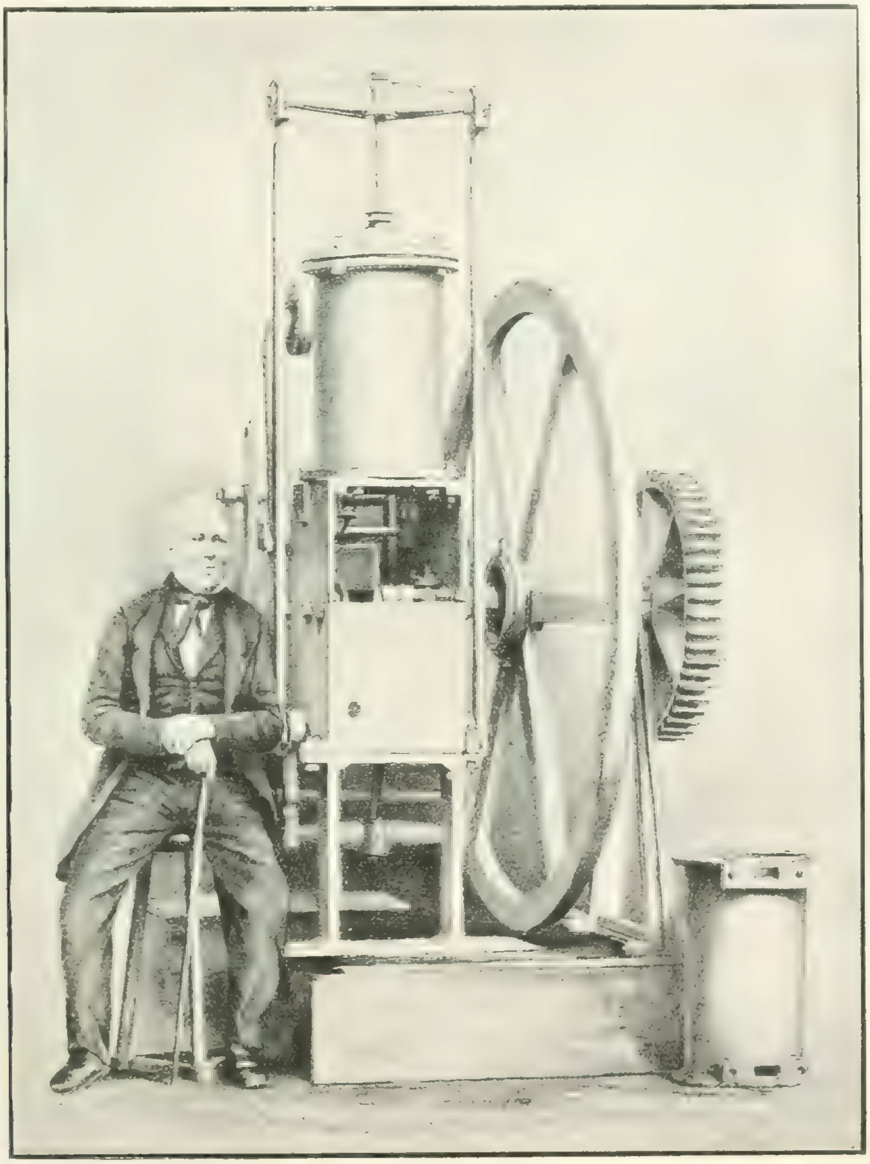
MESSRS. OSBOURNE, GRAHAM & CO. have, we understand, just completed negotiations to build, at their Hylton shipyard, a patent type of steamer for some well-known Newcastle owners. The vessel has been designed and patented by the Monitor Shipping Corporation Limited, of 5, St. Nicholas Buildings, Newcastle-upon-Tyne, and will be constructed under the superintendence of Mr. A. H. Haver, who will be remembered as taking a prominent part in the designing of turret ships. The main features of the patent consist of an increased longtidudinal strength, absolutely clear holds, and, owing to the formation of the hull, an increased deadweight, and considerably increased speed over and above the ordinary type of steamer at no extra cost to an owner. The new steamer is to be delivered in July next, and no doubt its progress will be watched with much interest by those concerned in shipping, and Sunderland people will trust for a considerable amount of work, both new and old, coming to the Wear, for the patent can be applied to old vessels, and might convert a boat which to-day is losing money into a dividend paying machine. The patent is protected in all countries, and Messrs. Osbourne, Graham & Co. have been appointed local agents to the Company, from whom full information as to royalties, etc., can be obtained, or from the patentees.



Original design of the "Comet," showing the lines of the ship.

THE "COMET."

SEVERAL references have recently been made to the " Comet " the first passenger steamer which plied on the Clyde and we have pleasure in reproducing the original lines and design of the vessel. The contrast between this illustration and the illustrations showing the large modern steamer is very great and affords an excellent object lesson to pessimist and optimist alike. The representations of Henry Bell, who was responsible for the " Comet," and to whose enterprise the building and engineering of the vessel was due, and of R. Napier, who built the boiler, along with a view of the engine, are also interesting memorials to place on record here.



Original Engine of *Comet* Steamer

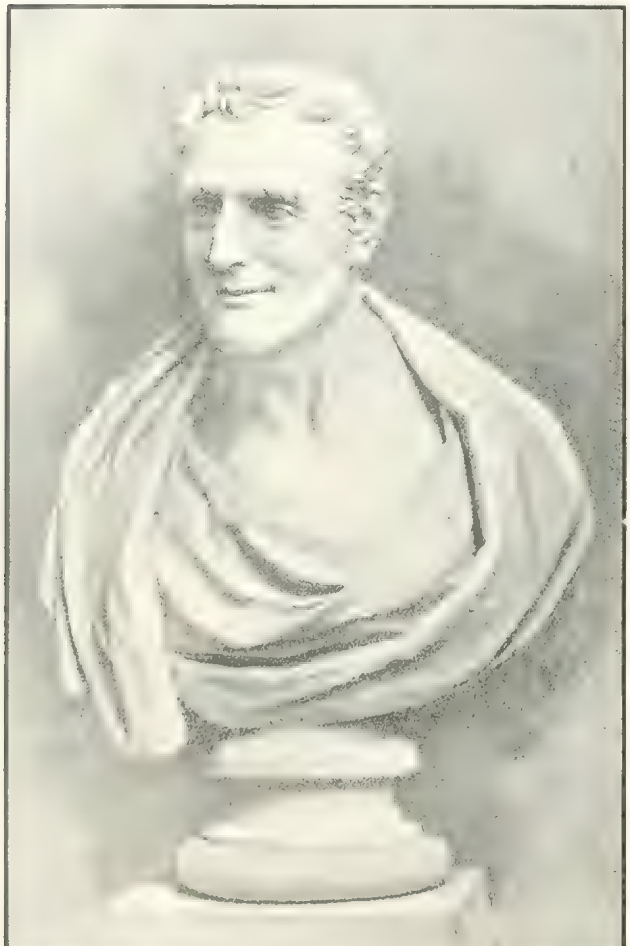
NAVAL MATTERS—PAST AND PROSPECTIVE.

(From our Own Correspondents.)

Portsmouth Dockyard.

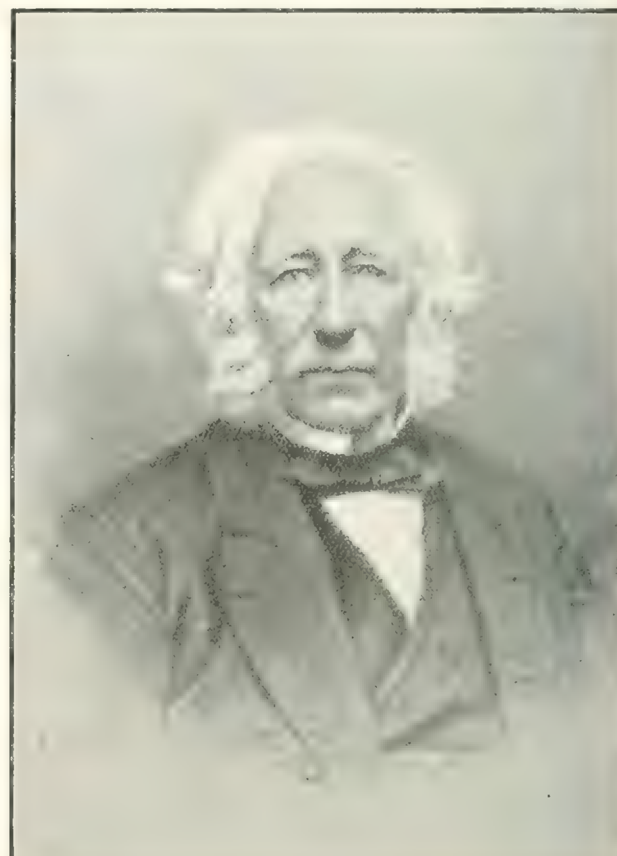
THE battleship *St.* [illegible] considerable [illegible] About half of the new [illegible] recently entered [illegible] shipwrights and they have been formed into ten gangs. Work for a great number has been found on the *St. Vincent*, while the others are employed on the vessels under repair. When our new ship is started in January more shipwrights will be needed, and there will be doubtless a fresh entry of men. The new battleship is to be called the *Neptune*, a name which is at present borne by a tug at Devonport. A *Neptune* was with Nelson at Trafalgar, while the last ship of the name rammed Nelson's old flagship the *Victory* while being towed out of Portsmouth Harbour to be broken up some years ago. The *Neptune* will be an improved *St. Vincent* of about 20,000 tons, with probably 24,000 horse power. There is a large

amount of material on hand. The *Bellerophon* is practically ready to join the Home Fleet at the Nore, and on December 14th was commissioned by Captain Evan-Thomas, who was recently private secretary to the First Lord of the Admiralty. As was expected, the Admiralty have decided to sell the *Gladiator*. It is a wise decision, for it would have cost nearly a hundred thousand pounds to have rendered her fit for service. A wooden patch is being placed over the hole in the starboard side, and the cost of this is not to exceed £500. The vessel will then be sold as she lies in dock and removed at the owner's risk. The cruiser *Latona*, which has been fitted as a mine layer, has arrived from Chatham and joined the Home Fleet. One of the vessels of the division, the cruiser *Amethyst*, is to be recommissioned on January 5th for service on the South-east Coast of America and the West Coast of Africa. She will be attached to the Atlantic Fleet and based on Gibraltar. Three of the Special Service vessels



Henry Bell

of the Home Fleet are to leave during January with relief crews—the *Sappho* for Colombo, the *Hawke* for China, and the *Royal Arthur* for the Mediterranean; so if these vessels are of not much value from a fighting point of view, they are good for service in other ways. The *Drake*, the flagship of the First Cruiser Squadron, came in at the end of November to ship two new anchors in place of two lost during the recent cruise. To make room for her the cruiser *Essex*, of the Home Fleet, went out of harbour to Spithead. On her way out the *Essex* met with a peculiar mishap. The cable of one of the anchors took charge and ran out, both falling to the bottom of the harbour. Fortunately, however, no one was injured. The refits of the battleship *Swiftsure* and the cruiser *Hampshire* have been completed and they have rejoined the Channel Fleet at Portland. There appears to have been some slackness as to the admission of foreigners to the dockyards, and a letter has been sent out from the Admiralty calling attention to the regulation that foreigners are not to be allowed to enter the dockyards or to visit any of His Majesty's ships without special permission. The rule at this yard has been invariably complied with. Another order, or rather warning, has been issued. Several cases have recently occurred of bluejackets having been detected in attempting to take out of the yard pieces of brass or white metal, probably of little intrinsic value and doubtless without felonious intent. Commanding officers of ships have been instructed to warn their ships' companies of the severe penalties to which men are liable for so doing, the Commander-in-Chief having approved a warrant for sixty days' imprisonment with hard labour for such offences. It was expected that Vice-Admiral Robinson would have relinquished the post of admiral-superintendent before now, as he completed two years in November. Rear-Admiral Login, who will, it is understood, succeed him, was promoted to flag rank from the Royal Naval Barracks, of which he was commodore, and he has since



R. Napier

been in command of the local division of the Home Fleet. Admiral Sir Day Bosanquet, who was succeeded as commander-in-chief at this port in the spring by Admiral Sir Arthur Fanshawe, has been appointed Governor of South Australia. It is curious what a predilection the Commonwealth of Australia has for admirals as governors. Admiral Bosanquet is the third admiral to hold such an appointment, the others being Sir Harry Rawson, who went to New South Wales in 1902, and Sir Frederick Bedford, who was appointed to New South Wales the following year.

Devonport Dockyard.

It has been officially announced that our new armoured cruiser is to be called the *Indefatigable*. This is rather an unusual proceeding, as there is already an *Indefatigable* in commission on the North American station. She is one of the *Apollo* class and was built eighteen years ago, and probably by the time the new ship is put into commission will be

ready for the scrap heap. Preparations are well in hand incidental to the laying down of the vessel. The sum allowed on her up to March 31st is £13[illegible] and she will be officially commenced in February. Orders, however, have been placed for material, and the principal characteristics of the ship have been consequently obtainable. As previously stated, she is to be an improved *Invincible*. The details available are (being compared with the *Invincible* class, which are given first):—Length, 530 ft, 570 ft.; beam, 78 ft. 6 in., 79 to 80 ft.; displacement, 17,250 tons, 18,000 tons; horse-power, 41,000, 45,000; speed, 25 knots, 28 knots. It is interesting to note that the longest ship built at this yard up to the present is the *Collingwood*, which is 536 ft. Work on that vessel is proceeding apace and the fixing of the barbette armour is being pushed on, so as to have as much of the heavy weight in position by the time she is docked early in the new year. The honour of being the first captain of the *Téméraire* has fallen to Captain Duff, who comes from the Controller's Department. The captain, who will supervise the final touches, as has been the usual thing with the last few vessels built, will find his ship in a very advanced state, with the exception of the engine rooms, in which progress was delayed by the engineers' strike. The vessel will shortly be docked for examination of her underwater fittings preparatory to her steam trials. The reconstruction of Torpedo boat No. 99 is now complete, and she presents such a new appearance that it is difficult to imagine her as the battered hulk which was raised from the bottom of the sea. A new torpedo boat, No. 29, has arrived from the Clyde, and has been commissioned as tender to the *Leander*, the depot ship for destroyers. The destroyer *Racehorse* has completed her refit and rejoined the Channel Fleet at Portland. Four or five vessels of the flotilla are still in hand. The destroyer *Gipsy*, which has been in hand for some months for an extensive refit, had only just been floated out of dock on December 10th when she sustained an accident. During a heavy squall, while endeavouring to clear the sea wall, alongside of which she had been lying astern of the cruiser *Hogue*, she was driven against the latter's counter. The blow fortunately was a glancing one, and the injuries sustained were not very serious, but she had to be taken back to the tidal basin for repair. After an absence of about four months the cruiser *Gibraltar*, of the Home Fleet, returned on December 10th with paid-off crews from the Australian station. This is the vessel, it may be remembered, on which during the outward passage some trouble occurred, gun sights having been thrown overboard. The cruiser *Cumberland*, training ship for cadets, returned from her cruise on December 4th. Before she leaves for her next cruise the fitting of magazine cooling appliances and new wireless apparatus is to be completed and her fire control and equipment generally brought up-to-date. The *Roxburgh* has completed her refit and rejoined the First Cruiser Squadron at Portland. We had a visit on December 1st from the First Sea Lord, who had a conference with the Commander-in-Chief and also with the officers commanding the Royal Naval College and the *Indus*, the mechanicians' establishment. The visit is understood to have been in connection with the future of the establishments. Our admiral-superintendent, Rear-Admiral Cross, was very much surprised to read that he had been selected to re-organize the Turkish Navy, and he has found it necessary to publicly contradict the statement, which originally appeared in a Turkish paper and was afterwards reproduced in the London press. The Admiralty have, it is true, consented to an admiral being selected by the Turkish Government, but up to the present no officer has been appointed. It will probably be an admiral on the retired list.

Sheerness Dockyard.

An almost unprecedented sight was witnessed in the Medway when Admiral Sir Gerard Noel, who, on vacating the post of Commander-in-Chief at the Nore, was promoted to Admiral of the Fleet, hoisted the Union Jack in his yacht, the *Undine*. Only once in the memory of the oldest inhabitant has the flag of an Admiral of the Fleet been previously seen in the river, that being when the *Hohenzollern* came here some years ago with the German Emperor on board. His Imperial Majesty, who is an honorary Admiral of the Fleet of the British Navy, then flew the flag on his yacht side by side with the German standard. No one, however, can call to mind an occasion when an Admiral of the Fleet on the active list flew his flag. Rumours have been in circulation, and statements have appeared in the papers, that the Admiralty have decided to include a floating dock in the Estimates, to be placed at this port. As stated in these columns on previous occasions, such a dock would be of considerable advantage, its need having been apparent for some time past. There is only one dock on the East Coast capable of receiving a vessel of the *Dreadnought* class, and as there will before long be several of the class in commission in the Home Fleet, some provision should be made notwithstanding the development of the naval base at Rosyth, which will be several years yet before it is completed. As stated many times, there is plenty of water in the Medway at the upper end of the harbour for two or three floating docks. From the reports which have been published there appears to be no doubt that the question has been under consideration. We must, however, await the publication of the Estimates to know exactly what the official proposals are. Her repairs below the water line having been completed, the *Teviot* has left to rejoin the Eastern Destroyer Flotilla at Harwich. The *Rother*, of the same flotilla, is to be ready to rejoin the broad pennant of Commodore Charlton by January 11th. The *Cossack*, *Panther* and *Erne* have come in during the month, and there are altogether half a dozen of the group in hand making good their defects. Before very long the flotilla will be entirely composed of the new ocean-going destroyers and the "River" vessels, the 30-knot boats being gradually withdrawn as the new vessels are ready to take their places. The battleship *Dreadnought* has gone to Portsmouth for her refit. Before she left Captain Madden vacated the command, having gone to the Admiralty as private secretary to the First Lord. The new commanding officer is Captain Moore, late naval assistant to the First Sea Lord-Admiral of the Fleet, Sir John Fisher. In the *Dreadnought's* absence the *Agamemnon* is acting as flagship of Vice-Admiral Sir Francis Bridgeman. Submarines "C 7" and "C 9" have completed their refits and rejoined the flotilla at Harwich, and "C 5" and "C 6" have come in for a refit.

Chatham Dockyard.

We are making good progress with our repair work. The refit of the special torpedo ship *Vulcan* is almost completed, and she has carried out her repair and gun mounting trials satisfactorily. Her engines and machinery have been overhauled and her gun mountings brought up-to-date, and she is now being prepared to enter upon her duties as depot ship for submarines. About £70,000 will have been spent on the vessel by the time she leaves here. The refit of the battleship *Implacable* is also completed and she has carried out her official trials satisfactorily. More men have now been placed on the battleship *Formidable*, the progress of whose refit has been delayed owing to the large amount of other work. The vessel has served three commissions in the Mediterranean, and this is the first overhaul she has had, and the £60,000 to be spent on her cannot, therefore, be considered at all excessive. The battleship *Irresistible* has completed her refit and is ready to rejoin the Channel Fleet, while another battleship of that fleet, the *Africa*, has come in for a similar purpose. The battleship *Triumph* will not be ready to rejoin the Channel Fleet until early in the New Year. This vessel was, it may be remembered, purchased from the Chilian Government four years ago, at the time of the Russo-Japanese War, and she has since served in the Channel Fleet. The cruiser *Inflexible*, which has been in hand since she was delivered from the contractors, is now practically ready to join the Home Fleet at the Nore. The new battleship *Lord Nelson*, which has been commissioned by Captain Sir Robert Arbuthnot with a nucleus crew for service in the same fleet, will not be ready until well into January, the remainder of her crew not having to join her until January 5th. She is to be the flagship of the rear-admiral, the *Magnificent*, which is at present the temporary flagship, being due here on January 1st for a refit. Rear-Admiral Colville will leave his command on January 3rd, and the flag of his successor (Rear-Admiral Briggs) will be hoisted in the *Lord Nelson*. The *Victorious* will then be the only battleship of the *Majestic* class left in the division. The *Cressy*, which was unable to accompany the Fourth Cruiser Squadron on its cruise on account of machinery defects, has left us and by this time has rejoined the flag of Rear-Admiral Inglefield in the Mediterranean. The *Black Prince* has

also left and rejoined the First Cruiser Squadron at Portland. Some additional work has been provided by the arrival of the *Shannon* for a refit. She is the last large vessel that was built here, and is now the flagship of the Fifth Cruiser Squadron. The *Cochrane*, of the same squadron, is to have her refit completed by January 9th. Good progress is being made with the conversion of the old hulk *Agincourt* into a coal hulk for service at Sheerness. She is a five-master and was last employed as a boys' training ship at Harwich. The torpedo gunboat *Gossamer*, which has been doing duty as a tender to the *Pembroke*, has been recommissioned with a Devonport crew and has proceeded to that port for service with the rear-admiral of the local division of the Home Fleet. A most important event during the past month was the transfer of the Nore command from Admiral Sir Gerard Noel to Admiral Sir Charles Drury, who arrived in the *Queen* from the Mediterranean. The vessel afterwards went on to Devonport to pay off and re-commission for service in the Atlantic Fleet. As anticipated last month, Sir Gerard was promoted to the rank of Admiral of the Fleet on leaving his post. The departure of the Admiral and Lady Noel is much regretted, as they both took such a great interest in matters outside the service and were always ready to support any worthy cause. The lectures given at the yard on turbines have been mentioned on previous occasions, and it is pleasing to find that the efforts of Vice-Admiral Giffard and Engineer-Rear-Admiral Rudd to add to the technical knowledge of the workmen is appreciated. At a recent meeting of the Gillingham Town Council a vote of thanks was unanimously accorded to the admiral-superintendent.

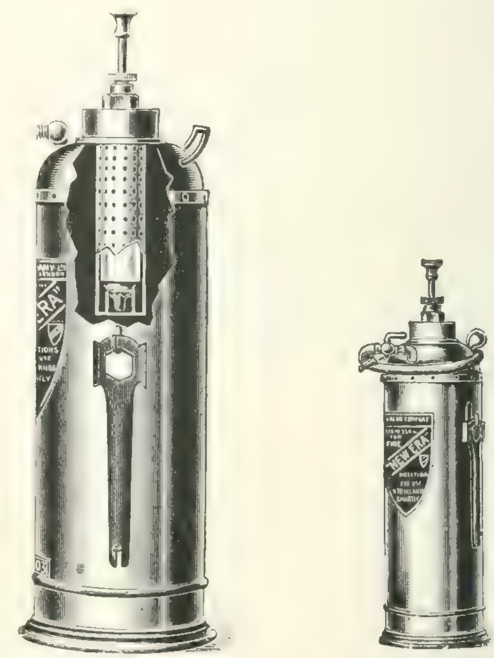
Pembroke Dockyard.

The cruiser *Defence* has carried out here the acceptance trial of her machinery, but on the following day (December 14th) in testing her anchors the capstan broke down. It does not appear as if the oil fuel arrangements will be completed before the end of the month (December) and the vessel will not, therefore, be able to leave until well into January. That will be close on four years from the time she was laid down. In order to complete her electrical installation some of the fittings of the *Boadicea* were removed and fitted in the *Defence*, this being owing to the non-delivery of her own fittings. The cruiser *Boadicea*, which is to be completed by March 31st, is in a very forward state, and two or three gangs of men have been taken off her and put on the *Bellona*. The date for the launch of the latter vessel has not yet been decided on. Boring operations for the propeller shafting will be commenced about the end of December. A rumour has been in circulation that provision has been made in the Estimates for commencing an armoured cruiser of a new type here in the next financial year, but it will be as well to await the appearance of the Estimates. It is more than likely that nothing of the kind is contemplated. The destroyer *Violet*, which has arrived from Devonport, is to have her propelling machinery overhauled, her boilers retubed, and to be generally refitted. The torpedo gunboat *Spanker*, which came from Portsmouth, is also in hand. Another vessel to come in for refit is the torpedo gunboat *Halcyon*, which arrived on December 15th. The coastguard tenders *Fanny* and *Thrush* are also due shortly. The destroyer *Greyhound*, which has had her propelling machinery overhauled and her boilers retubed, has carried out a successful preliminary trial, during which she attained a speed of 29 knots. The official trial, on account of bad weather, was postponed until after the *Defence* underwent her acceptance trial. As anticipated last month, Captain Mundy has succeeded Rear-Admiral Kingsford, and the new superintendent, who has been in command of the battleship *Commonwealth*, in the Channel Fleet, took up his duties on December 12th. If Sir George Armstrong, the Unionist candidate for the Pembroke and Haverfordwest Boroughs, ever gets into Parliament Pembroke will have a staunch champion. He made a splendid speech the other day, which is generally acknowledged to have been the best attempt that has ever been made by a Parliamentary candidate, to set forth the claims of the yard and port to better recognition. Sir George was, it is interesting to note, formerly a lieutenant in the Navy, and he is now on the Emergency List.

THE "NEW ERA" CHEMICAL FIRE EXTINGUISHER.

THE recent disasters of ships on fire leads one to carefully consider the necessity of simple and efficient means for attacking a fire at its very commencement, if possible. We illustrate in the adjoining diagrams a part sectional and a plan elevation of one of the latest types of chemical apparatus manufactured by The Valor Company, Ltd., of Aston Cross, Birmingham. These devices are made in seven sizes, of capacities varying from one to five gallons.

At a recent demonstration, at which we understand Capts. Warden and Clarke of the Board of Trade were present, a structure 12 ft. × 12 ft. × 4 ft., with



numerous cross battens covered in wood wool, was erected. The whole was coated with five gallons of coal tar, and five gallons of paraffin was poured over the whole. In front a tar lake covered with paraffin was formed and connected with the main structure by a train of shavings soaked in oil.

When lighted and burning fiercely, a three-gallon "New Era" apparatus was brought into play from a distance of 40 ft. and completely extinguished every vestige of fire in 40 seconds; and afterwards it was found that 2 gallons were still unused in the machine.

This size and type of machine is particularly adapted for use in the alley ways and in the steerage accommodation, a special feature being that the chemical fluid used is quite harmless to either the person or to fabrics of any description.

GEIPEL'S RAPIDITY STEAM TRAP.

THE Geipel Steam Trap has now been on the market ten years, and the measure of its merits is indicated by the number sold, which we understand is upwards of 100,000, and which are in use all over the world.

The main features of the Geipel trap consist firstly in the method by which the expansion is multiplied without the use of levers, cranks, etc., by which great simplicity is obtained, combined with a movement which is definite and which has no lost increment, as is usually the case where levers and pivots are adopted, and secondly in the provision of a yielding abutment, by means of which excessive expansion, due to a varying steam pressure, is rendered innocuous to the valve seat.

With regard to the latter it is somewhat curious that although expansion traps had been in use since about the year 1864, and that this difficulty had been a continual trouble, yet no successful attempt appears to have been made previous to Geipel's to overcome this objection.

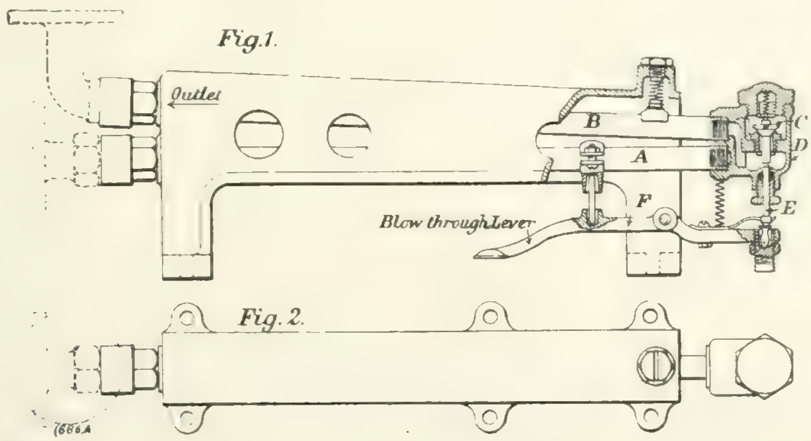


Fig. 1

Fig. 2.

These two features formed the principal points in the patent action for infringement by another party, which was heard some years ago and was carried to appeal, which was decided in Mr. Geipel's favour. In his judgment Mr. Justice Swinfen Eady stated that it had been proved that this invention had made expansion traps practical and useful, and that there was not another expansion trap in the market which substantially competed with it.

Recently important improvements have been made in the construction of the Geipel trap, although in respect to the above features the trap remains unaltered.

To distinguish the new trap from its predecessor it has been given the title of the "Rapidity Steam Trap."

The valve is arranged so that it is held on its seat by steam pressure, instead of by means of an abutment against steam pressure, as is the case in the ordinary trap, consequently it is held on its seat with a much greater force, whilst the diameter of the valve has been increased.

The valve also rotates, and so tends to grind itself in every time a discharge takes place, and when blowing through it is forced well off its seat, thus giving a maximum opening with rapid discharge. The valve is quite loose and disconnected from any other part of the trap; it can be removed from its casing by simply unscrewing the valve cover without in any way interfering with the steam connections, so as to be easily removed, inspected and cleaned, an operation which can be done in less than one minute.

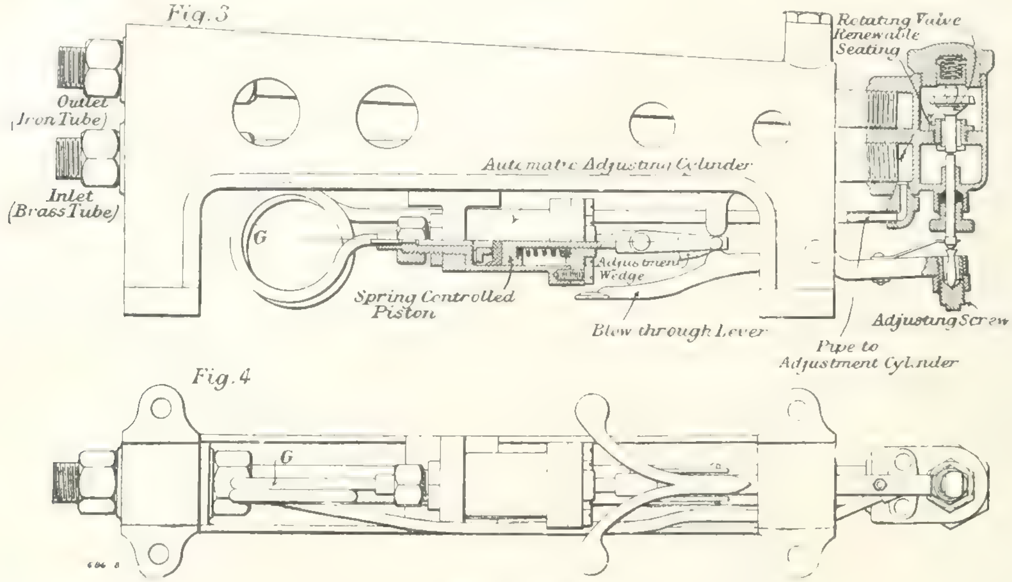
The importance of having a valve whose seat is of large diameter and of considerable lift is obvious. A glance at the discharge capacities specified for these traps, which vary from 750 to 1500 gallons per hour according to size, shows what an ample valve opening the Rapidity Trap provides. It must be conceded that such a size of opening is quite impracticable with float traps, especially for high pressures, because it is necessary, in order to provide sufficient force to shut the valve, to have a float and casing of abnormal dimensions, such as would still further increase the excessive loss by radiation occasioned by traps of this description. To avoid this difficulty it is common to use valves of very small diameter; some of the valves in well-known float traps are as small as $\frac{3}{32}$nd of an inch in diameter, although the inlet is as large as one inch, several hundred per cent. larger than the valve.

The use of so small a valve results in its rapid destruction, combined with a tendency for it to get choked with the slightest amount of dirt, the latter being not an infrequent element to be dealt with in the draining of steam pipes.

Even with so small a valve, the radiating surface of such a trap is of several square feet, whilst in the case of the Rapidity trap the surface is only from $\frac{1}{4}$ to $\frac{1}{2}$ sq. ft., according to the size of the trap. When it is remembered that every square foot of surface continuously exposed to the heat of steam represents a loss by condensation at the rate of half a ton of coal per annum, then the economy of using a trap of small surface is apparent, a point which is frequently lost sight of by users of steam traps. A float trap will account for several tons against one-fourth of a ton for the largest size of Rapidity trap.

This trap has a wide range of pressure through which it will work without adjustment, it being only necessary to set the trap for the lowest pressure at which it is required to operate, beyond which any increase of pressure or temperature merely moves the

valve casing away from the point of abutment, whereas in the case of the ordinary trap an excess of pressure causes an extra strain upon the expansion tubes; for so long as the trap contains steam and the valve is closed thereby there is no strain on the expansion tubes, the strain occurring only momentarily when the valve is being opened, whilst as soon as the valve is open there is again no strain on the tubes, whereas in the case of the ordinary Geipel or other expansion traps the expansion tubes are continually under strain.



Figs. 3 and 4

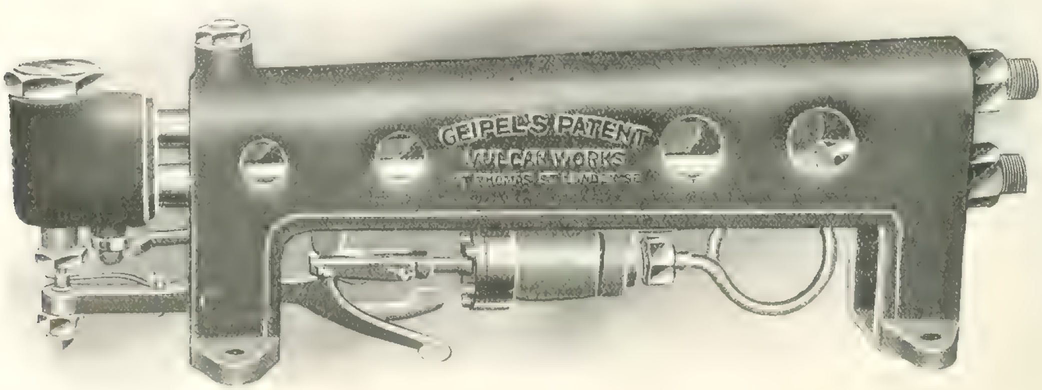


Fig. 5

The construction of the trap is shown in Figs. 1 and 2. The brass tube A, which forms the inlet, is connected to the vessel to be drained and is at the bottom of the trap, and the iron tube B, which constitutes the outlet, is at the top, as in the ordinary Geipel trap. In the valve body a passage leads from the entrance of the brass tube to the upper side of the valve C, whilst the passage from the lower side connects to the iron tube B; the pressure therefore comes on the top of the valve. When the trap is cold or full of water the brass tube A is contracted, so that the valve casing D is accordingly pulled into its lowest position; and the valve spindle E, which abuts against the lever F, is in contact with the valve and has raised it from its seat. When steam enters the brass tube the latter expands and moves the valve casing upwards. The steam pressure closes and holds the valve tight on its seat until water has again entered the brass tube and caused it to contract and again pull the valve casing downwards. Just as the valve opens a rush of water takes place which forces the valve upwards and causes a large opening and therefore a rapid discharge, whilst at the same time the rush of water catches the veins provided on the periphery of the valve, causing it to rotate and grind itself in at each discharge, the action dispensing entirely with the objectionable throttling so commonly prevalent in steam traps. A sharp blow through occurs at each opening until all the water is discharged, after which the valve is suddenly closed. This greatly prolongs the life of the valve because of the absence of that cutting action which occurs when water or steam is leaking through dribbling or improperly opened valves or, in other words, passing through narrow

apertures at high velocity. The lever for blowing through can be used by hand or foot according to the position in which the trap is placed.

In order to comply with the Admiralty requirement that a trap must be capable of working from atmospheric pressure up to 300 lbs. per sq. inch without adjustment, Mr. Geipel has introduced a new method of automatic adjustment, which is illustrated in figures 3 and 4.

The automatic adjustment is shown underneath the frame of the trap in figure 3. It consists of a cylinder which is connected to the pressure side of the valve casing by the coiled tube G. The position of the piston is controlled by a helical spring adapted to move the adjustment wedge outwards according as the pressure rises and *vice versa*. This has the effect of raising the abutment by means of which the valve is opened. The higher the pressure at which the trap is to work, the higher the position taken up by the valve casing. The angularity of the wedge is adjusted so that it gives the precise movement required by the abutment to accommodate itself to the various positions of the valve casing. Fig. 5 represents a perspective view of the Admiralty pattern of trap.

THE ELECTRICAL TRANSMISSION OF POWER FOR MAIN MARINE PROPULSION AND SPEED REGULATION.

THE adjourned discussion on the paper read by Mr. W. P. Durtnall on "The Electrical Transmission of Power for Main Marine Propulsion and Speed Regulation" before the Institute of Marine Engineers, was held at the London Institution, Finsbury Circus, on Monday, November 2nd. The meeting was presided over by Mr. W. McLaren (member).

In opening the discussion, Mr. W. E. Farenden said he failed to see how the estimated saving in coal consumption was to be effected in the proposed system as compared with the reciprocating engine and the consequent loss of power, due to the number of elements. Mr. F. M. Timpson thought the adoption of electrical transmission was not impracticable, but questioned whether the proposed system would be economical with low speeds and also whether it would ensure good governing in the event of "racing" of the propeller shaft. Mr. J. H. Redman asked if the author could give some idea of the size of motor required for a vessel of about 3,000 horse-power with a 15 ft. propeller, and also if the motor could be brought down to a shaft revolution of about 60 to 70 per minute. Mr. F. Broadbent considered that Mr. Durtnall's system, used in conjunction with the steam turbine, as was proposed, was a very good one. With the electric drive proposed by Mr. Durtnall, the turbine could be run at full speed all the time, and therefore at its highest efficiency, while the speed of the propeller could be varied as required. With the induction motor there was very little torque in starting, but as the speed ran up the torque increased and therefore the motor lent itself very well to marine propulsion. He thought very large economies in coal, space and weight could be effected by the adoption of the system. Referring to the view expressed that the electrical system would be not economical with reciprocating engines, Mr. H. H. B. Deane said the engineer was not limited to steam, as rapid progress was being made with the internal combustion engine. In his opinion, Mr. Durtnall's system was an ideal one from an electrical engineer's point of view, as marine conditions were especially suited to the polyphase, and particularly the short-circuited rotor motor. Another advantage was that Mr. Durtnall proposed to change the speeds when there was no current in the system. Rapid variations could be easily performed with the splendid breaking action of the polyphase machine. Mr. A. Robertson did not think the turbine compared so favourably with the reciprocating engine as to induce a shipowner to adopt the proposed system. He understood that the loss in transmission would be nearer 15 per cent. than the 10 per cent. mentioned by Mr. Durtnall, at least that was the case with small installations. He asked what the cost would be of installing the system, as compared with that of reciprocating engines, for an average cargo steamer. Mr. H. Willis considered the real test of efficiency was whether the system would work equally well with the Atlantic liner of 70,000 h.p. and the steamer of 3,000 h.p. Mr. E. Austin was of opinion that the squirrel-cage motor was unsuitable for variation of the speed. The only efficient way in which this could be done was by changing the number of poles; the frequency could not be altered without altering the speed of the generators. He thought the slip ring motor would be more suitable. Mr. E. P. Hollis considered that the turbine was most suitable for marine work. For the electric drive, in his opinion the induction motor was most suitable, as far as reliability was concerned. The Hon. Secretary remarked on the improved efficiency of the reciprocating marine engine during the last twenty-five years, an efficiency which the turbine had not yet reached, due to the losses at the propeller end. The combined turbine and reciprocating engine would soon be on its trial in large steamers and expectation was that a further economy would be shown. In his presidential address, Mr. Denny had ref rred to a method of transmitting power to the propeller by electrical machinery, but on drafting out the arrangement and considering it, the cost was considered prohibitive—probably spare gear and upkeep being reckoned. The cost of coal per horse-power transmitted to an efficient propeller was the great consideration next to first cost and upkeep. At the present stage of the discussion—which marine engineers entered upon with open minds—he considered there was not sufficient data to guide them either to discuss the subject freely or fully, and he suggested that the discussion might be adjourned. The internal combustion engine had been referred to; it was now on its trial and engineers were preparing themselves for it and they were ready to consider and study it for electrical power transmission.

Before calling upon Mr. Durtnall to reply, the Chairman said he did not see why the space above the machinery, referred to by Mr. Robertson, should not be utilised. He doubted whether the electrical machinery would stand rough weather, and contrasted the skill and rapidity with which breakdowns were repaired on the reciprocating engine, with the disastrous results likely to take place in the case of any serious breakdown of electrical machinery.

It was agreed that the discussion be adjourned until the second week in January, when Mr. Durtnall would have time to reply fully to the various questions raised, the meeting to be held in the Institute premises at Stratford.

In the meantime Mr. Durtnall said his system was designed for use in conjunction with the steam turbine. Misapprehensions as to its working were mostly raised through the idea that he wished to adapt it to reciprocating engines, which, of course, was impracticable. The figures in his paper had been confirmed during the last few weeks by manufacturers in Germany, France, Switzerland and in this country, especially in relation to steam consumption. Perfect control could be obtained in the event of racing of the propeller. The motor could be brought down to a speed of 60/70 revolutions per minute, but it was not advisable to do so. The cost of a 4,000 to 5,000 h.p. set would probably be about £4 10s. per kilowatt.

The meeting closed with a vote of thanks to Mr. Durtnall.

MESSRS. WM. ESPLEN SON & SWAINSTON.—This firm has been in existence in London for a period of *twenty* years, instead of eight years, as erroneously mentioned in our last issue.

MESSRS. MILLER & MACFIE, LTD., have acquired and turned into a private limited company the business of Marine, General Engineers and Boilermakers, lately carried on by Messrs. Colin Houston and Co., 20, Stanley Street, Paisley Road, Glasgow, and the business will now be carried on under the name of Miller & Macfie, Limited, at the above address.

NEW HOME OF THE INSTITUTION OF ENGINEERS AND SHIPBUILDERS IN SCOTLAND.

THE Institution of Engineers and Shipbuilders in Scotland have now entered into occupancy of their fine new buildings, which, as related in our issue for April 1st last year, at the time of the laying of the foundation stone, have been erected partly to commemorate the jubilee of the Institution, but quite as much in order to give the membership (now over 1600 strong) more adequate and worthy housing than has obtained for many years past. Into the history of the Institution, and the influential men of science and industry who have graced the roll during its existence, it is needless again to enter, the illustrated account referred to having pretty fully traced these subjects. Our present aim is to indicate, as concisely as possible, the character of the housing now completed and the function of "house warming" which took place on the evening of December 3rd. The inception of the undertaking dates back several years, and on the part of many influential members great readiness was evinced to further the project financially. At the time the fund was started Mr. James Gilchrist, of Messrs. Barclay, Curle & Co., was the president, and before he demitted office the undertaking was materialized to the stage of foundation stone-laying. For the finances of the scheme Mr. Gilchrist is entitled to a large share of credit, while Mr. Chas. P. Hogg, M.I.C.E., chairman of the Building Committee, has given freely of his time and special knowledge to ensure success in the practical aspects of the undertaking. Mr. John Ward, of Messrs. Wm. Denny & Bros., Dumbarton, the president last year and this year—whose portrait we have now pleasure in presenting to our readers—has also been ardent, as have other members of Council, in the responsible work of bringing the scheme to a successful issue.

The building occupies a prominent corner site on one of the leading arteries of Glasgow, namely, Elmbank Street, nearly opposite the High School of Glasgow, not far from Charing Cross and within easy access from all parts of the city and suburbs. We have pleasure in illustrating three views of the interior from photographs kindly put at our disposal. The building is designed in the style of the later English Renaissance, and the architect, Mr. John B. Wilson, A.R.I.B.A., 92, Bath Street, Glasgow, has aimed more at a dignified than an ornate effect. The block consists of three floors and a basement, the entrance front facing Elmbank Crescent. The main entrance here forms a projected porch carried on stone columns with delicately carved caps, the pediment being filled with a carved shield bearing the arms of the Institution. The pediment is intended to be completed with a sculptured group representative of Science and Industry, but this feature is meantime left in abeyance. While substantiality rather than ornateness strongly marks the structure, gables, pediments and other parts are relieved and enriched by elaborately carved medallions and shields, bearing emblems of engineering, shipbuilding and other interests of the Institution. Substantiality rather than ornateness is also the keynote of the interior, both as regards the materials used and the ornament applied. The staircase and landings are spaciously open and copiously lighted by windows as well as by a handsome dome roof. Rich stained glass fills many of the windows, a feature in the staircase lights being the portraits of famous engineers, the national and city arms, and the shields of all the principal engineering and shipbuilding centres of Scotland.

The ground floor is occupied mainly with the library and reading-room, secretarial offices, committee rooms, cloakroom, etc. On the first floor are the small hall, the council-room and various meeting-rooms, the major portion of the space, however, being occupied with finely finished smoking and coffee-rooms. The main lecture hall occupies half of the whole space on the upper floor, the dimensions of this apartment being 72 ft. by 40 ft., having comfortable seating accommodation for between 450 and 500. The main council-room is also on this floor, and an ante-room between it and the main lecture hall. Besides the staircase there is a passenger lift from the basement to upper floor, and under the whole building a commodious basement serves for book storage, motor and engine-rooms, etc. Smoking-room, coffee-room and such like accommodation is ample and well arranged, and provides a feature which is certain to be greatly appreciated by all sections of the membership. The cost of the whole is expected to amount to about £30,000, of which some £5000 is still to be gathered.

The formal opening of this new home of the Scottish Institution took place on December 3rd, the occasion taking the form of a conversazione, concert and dance, at which about 500 ladies and gentlemen were present. The guests were received by Mr. John Ward, president, and Mrs. Ward, and by Mr. C. P. Hogg, vice-president, and Mrs. Hogg. Early in the proceedings Mr. Ward addressed the assembled company in the large lecture hall, extending a hearty welcome to members and friends, and congratulating the Institution on possessing a home worthy of itself. In eloquent terms he pointed to the high aims and objects which the Institution should ever have in view, the realization of which would no doubt be greatly ministered to by the home they were now about to occupy. The birth of the Institution fifty-one years ago might not have seemed a great event amid the public occurrences of the time, but its significance they all realized and valued now. In the first session, 1858, the total number of honorary members, members, associates and graduates was 127. At the close of the tenth session they had 386, at the close of the twentieth session 478, at the close of the thirtieth 636, at the close of the fortieth 887, and to-day the total roll was 1650. Following Mr. Ward's inspiring address the Lord Provost of Glasgow congratulated the Institution on its new home which, as a building, was a credit to the city. The Institution had indeed secured a habitation worthy of the important position which it occupied in the scientific and industrial economy of Glasgow and the West of Scotland.

The inaugural meeting of the session, and of the beautiful domicile, took place on December 8th, when Mr. Ward delivered a weighty and eloquent presidential address before a crowded meeting.

BRITISH STANDARD PIPE THREADS for Iron and Steel Pipes and Tubes authorised by The British Engineering Standards Committee. Messrs. Stewarts & Lloyds, Limited, advise us that they have made the following arrangements with regard to the above:—(*a*) From 1st January next, Tubes and Fittings will be screwed British Standard Threads when so ordered by customers. (*b*) From 1st July, 1909, all Tubes and Fittings will be screwed British Standard Threads, unless otherwise ordered.

INSTITUTE OF MARINE ENGINEERS.—The annual conversazione and ball of the Institute of Marine Engineers was held in the King's Hall and Council Chamber, Holborn Restaurant, on Friday, December 11th. From 7 o'clock till 8-30 an excellent programme of vocal and instrumental music was provided in the Council Chamber, the artistes including Misses Hettie Stammer and Esther Yunson, and Messrs. A. H. Gee, Will Tebbutt, Maurice D'Oisly and E. Wallace Campbell, whose selections were greatly appreciated by the assembly of members and friends. Immediately after the concert, a reception was held by the president of the Institute, James Denny, Esq., and Mrs. Denny. Dancing was commenced in the King's Hall at 9 p.m. and was continued till 3 a.m., music by the string band of the 2nd London Brigade, Royal Field Artillery, under the direction of Mr. E. Campbell. The joint-conveners for the evening, Messrs. A. H. Mather (hon. treasurer) and John McLaren (member of council), are to be congratulated on the enjoyable nature of this brilliant social function, as are also the hon. secretary and members of committee, to whose efforts the success of the evening was in a great measure due. For the harmonious carrying out of the details of the programme, a word of appreciation must also be given to the M.C., Mr. E. Rhodes Mitchell; assistant M.C.'s., Messrs. J. H. Redman, J. G Rendall and A. Robertson; ballroom stewards, Messrs. P. Boyd, R.N.R., W. Britton, D. Hulme, G. T. Veness and J. Weir; reception committee, Messrs. Jas. Adamson, John Clarke and Wm. I. Taylor; director of concert, Mr. John Lang, R.N.R.; and concert room stewards, Messrs. J. Clark and R. Balfour. The other members of committee were Messrs Geo. Adams, A. E. Battle, J. Blelloch, Aitken Brown, P. T. Campbell, Thos. Drewry, W. E. Farenden, J. G. Hawthorn, W. Howell, R. Leslie, R.N.R., J. T. Milton, John Nicoll, J. F. Redman, W. C. Roberts, R.N.R., J. G. Robertson, E. W. Ross and A. W. Seabrook.

The Large Hall, Smoking Room, and Entrance Hall in the new building of the Institution of Engineers and Shipbuilders in Scotland.

INSTITUTION OF ENGINEERS AND SHIPBUILDERS IN SCOTLAND.

Presidential Address.

The presidential address delivered to the Institution of Engineers and Shipbuilders (Scotland) in the handsome new premises in Glasgow, on Dec. 8th, by Mr. John Ward, of Messrs. Denny Bros., Dumbarton, was full of interest and suggestion. The initial proposition set forth was that the engineer and shipbuilder are promoters of the social welfare of the people, and therefore civilizers. On the one hand they gather from the products of nature what she is willing to yield of her store, and on the other apply these products by skill and workmanship to the use of man for the purpose of supplying his wants to a fuller measure than could otherwise be accomplished. Referring to early applications for the purpose of providing power to manufacture articles, the service of water was remarked upon, with its inconstant supply and the efforts made to obtain means less intermittent in action. The inventions of Arkwright, Crompton and Cartwright were noted in connection with spinning and weaving, and the rapid advance made on the introduction of steam power in these industries. The conversion of pig into malleable iron in 1783 was followed by the rolling of bar iron a year later. The greater economy of hot blast was proved in 1828, effecting a saving of about 33 per cent. in fuel. In this industry, again, the application of steam power brought about enormous changes and increase in productive power with further economies in manufacture. Then followed the establishment of larger factories with capacity for a greater output under more economic conditions, thus utilizing more fully the labour expended, whether muscular, mental or artistic. In measuring the results of engineering advancement, it behoved one to consider the general effect upon the community before attempting any discussion of its monetary, physical and intellectual influence on the workers. The effect of machinery upon national prosperity could be seen in the harvest fields at home in the reaping season, and in a more pronounced way in the more extensive plains of America, where mechanical appliances were indispensable. The saving of thought, time and labour in connection with all the phases of agricultural work had been immense, from the ploughing of the soil to the threshing floor, and beyond that to the large power mill, the interior arrangements of which formed an impressive sight for any visitor, with its multiplicity of machines, and hardly a workman to be seen, thus from the time the grain entered the conveyers till it left as flour, at the rate, in moderate-sized mills, of 100 sacks of 280 lbs. each per hour, it was untouched by hand. The mechanical appliances for loading and discharging cargoes were then cited by Mr. Ward, to show the saving in labour with greater economy effected over the older methods, grain being loaded into or discharged from a steamer at a labour charge of one-eighth of a penny per bushel, while the grain could be converted into flour for a labour charge of about fourpence per sack. The total cost was a shilling per sack of 280 lbs., including power and labour, with a percentage allowance for depreciation and interest on capital. The art and work of the bakery had also been invaded by machinery, so that the labour charge was now reduced to about one-fourth. It might therefore be claimed that in connection with the "staff of life" the engineer had proved a benefactor to his race. Turning next to the tool-making industry, it was pointed out that machinery produced five cold chisels in the time taken to make one by hand, while two circular saws, seventeen chipping hammers, or ten riveting hammers could be produced in the time taken respectively to make one by hand. The authority of the late Lord Playfair was quoted to show the increased productivity of labour by mechanical methods to be, of metals and of metallic goods, quite 33 per cent., and of machinery generally about 40 per cent. Another authority estimated the increased productivity between 1850 and 1885 to be, in this country, all round about 40 per cent. An American authority reckoned the gain in the United States between 1870 and 1886 to be 33 per cent. There were cases, such as repeat work and in textile factories, where the increased productivity reached higher percentages than those named. The first effects of machinery alarmed the workers, and to such an extent was this felt that in 1774 a special Act of Parliament had to be passed to enable Arkwright to sell the products of his spinning mill; thus were the inventor and the capitalist who helped him served. The question of exchange of commodities for commodities between communities and nations was next discussed, and it was pointed out that the view expressed by the economist in this connection could only be realized when, and as long as, the goods produced by one were required by the other, which other likewise had the purchasing or exchanging power to meet the requirements. Beyond this arose the importance of extending and broadening the area of the markets with each development in productive power and economy in manufacture. The development of land and sea traffic opened up the way to give outlets for the increased manufactures

Photo by Lafayette, Glasgow.

John Ward, Esq., President of the Institution of Engineers and Shipbuilders in Scotland.

thus the extra ploughs exported to an agricultural community brought in exchange the grain which they were instruments in producing. Thus the widening of the markets required by the engineer had been the work of the shipbuilder in whose yards the productive power was increased with mechanical means by about five times as much as formerly with hand labour. The cost of a cargo steamer per ton carried was now less than two-thirds of what it was thirty years ago. Greater economy had also been attained in the working of ships, by dispensing with yards and the addition of several appliances to reduce the cost of handling of ship and cargo. The improved efficiency of the machinery had also had even a greater effect in reducing the cost of ocean transport, one ton of cargo being now carried for 4 lbs. of coal in large capacity steamers of 12 knots, while thirty or forty years ago it was many times that amount. All these influences had tended to reduce freight rates. Twenty years ago it was computed that the opening of the Suez Canal involved a saving of 2,000,000 tons of shipping in the Eastern trade; the saving now was not so marked between the longer route *via* the Cape and the Canal, due to the greatly reduced running costs of cargo steamers. To meet the requirements

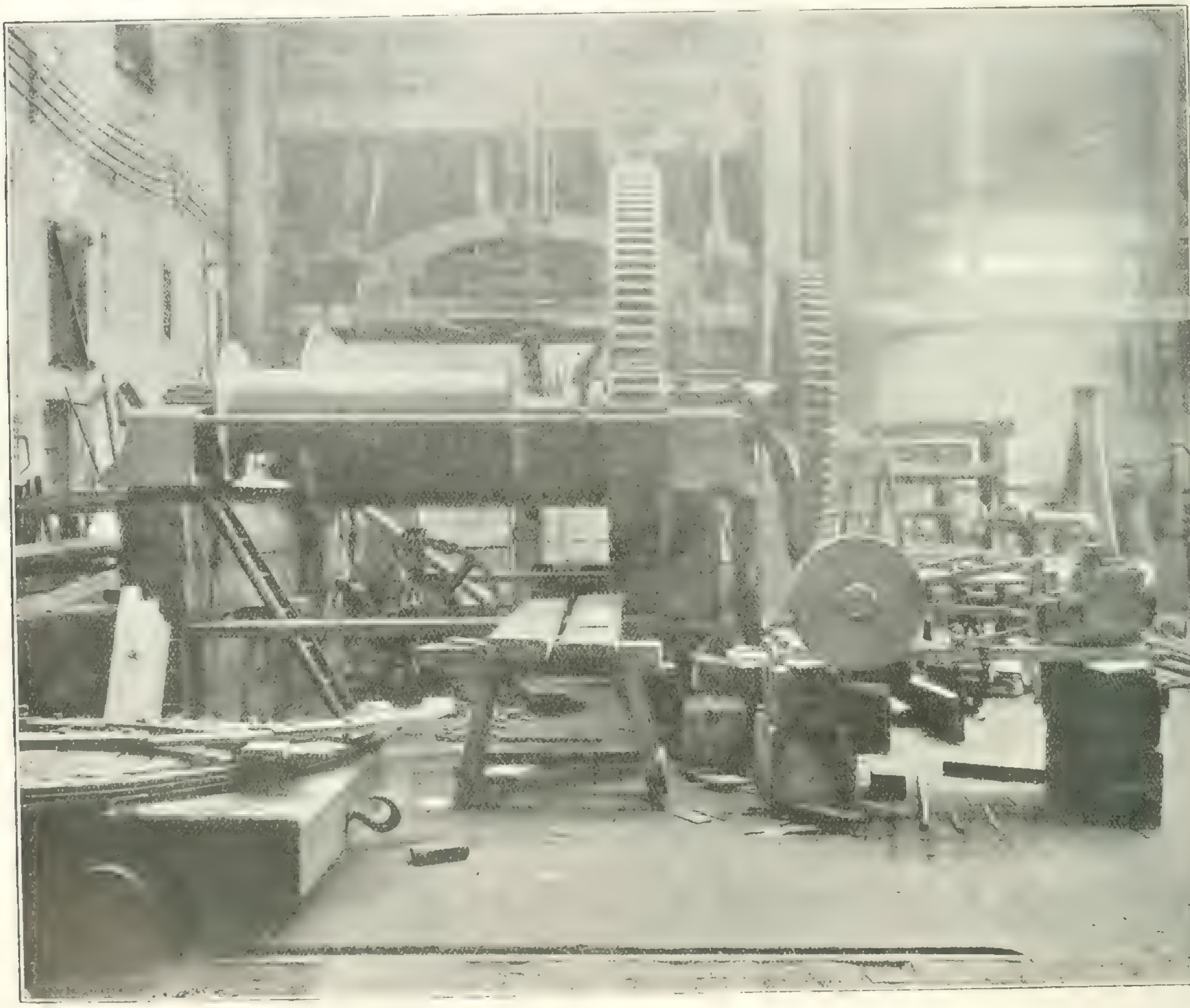
of the increased sizes of steamers, harbour, dock and canal engineers had not been idle, either at home or abroad, but had been working to provide the necessary accommodation. While there had been a gain in enlarging the market area for manufactured goods, there had also been a gain in widening of the sources of supply, so that gradually industrial interests which 100 years ago were local had now become universal. Nature had not endowed any one country with all her bounties and it was well that the transport of produce and manufactures could be accomplished at a cost which made distance and national idiosyncrasies insignificant factors in meeting the requirements of communities. We readily take our iron ore from Spain, Norway or Sweden; copper from Spain; nickel from New Caledonia and Canada; cotton from America, wool from South America, the Cape and Australasia; and timber and other supplies from nearly every country. A question which was forcing itself to the front was as to the extent to which raw material could be prepared at the source of supply, mainly on financial considerations. National wealth was the outcome of manufactures rather than of natural supplies, hence nations which could produce the raw material were gradually seeking to convert the raw material into the finished products; for example, in place of wood in the rough, the finished doors and window frames were exported from the countries possessing wood. So also in our industrial work. To such an extent had design and accuracy of work been reached that it was easy to convey units over great distances with the assurance that they could be combined into the designed whole; thus the bridges for the Nile were made in this country, sent to Egypt and there put together, ready for riveting up with rapidity and ease. Similarly hundreds of steamers had been made and sent out to the East, with their units marked, unpacked at their destinations, rebuilt and completed in the dockyard. So also other structures had been similarly dealt with and the system was extending, due largely to the effects of standardizing and economic conditions, added to by the increased facilities of transport. Competition must become keener, especially where the manufactured or partly manufactured article is lighter and less bulky or more convenient for transport than the constituent raw materials. Such competition could only be met by higher efficiency of labour, greater productivity, improved machinery, with the necessarily greater investment of capital. Since the primitive agriculturalist and the vineyard labourer used their tools, capital had been essential to labour and the prosperity of nations had grown in direct proportion to the utilization of capital in labour, and to the productivity of labour in the application of mechanical methods. The importance of capital had greatly increased, bringing great changes in industrial and social conditions. Factories had been multiplied and enlarged, specialization had become a necessity, and standardization an advantage in the utilization of machinery to its highest degree of productivity. While these conditions had involved temporary hardships to some, with advantage to other trades, there had been a great gain from the national point of view. The large capitalist was able to finance large undertakings, and from his resources could ensure the difference between profit and loss. The risks in business were enormously greater than formerly, and the large establishments, efficiently managed, must hurt or displace smaller concerns. The introduction of the telegraph and telephone by the electrical engineer had greatly assisted large establishments, admitting of reduced storage of material for possible requirements and of minimised effort in managerial control. Every department of shipbuilding and engineering had contributed greatly to the national gain, and the shipbuilders and engineers of this country had the satisfaction of being pioneers. Along with this, however, it had to be realized that other nations had advanced and more strenuous efforts were needed, whether actuated by the desire to benefit mankind by adding increased comforts to man, or by the necessity of fighting for pride of place in engineering and shipbuilding. While less than twenty years ago Britain had virtually a monopoly of marine engineering and shipbuilding construction, as well as of the carrying trade of the world, to-day most of the continental nations and at least one Eastern nation had developed these industries to an up-to-date position.

The notion that the introduction of machinery and increased productivity were detrimental to the interests of the purely working classes was accepted too readily, and its falsity was proved by the history of industrial progress. A yard of calico made by hand cost 2s., whereas machinery had reduced the cost to 4d.; other articles of wearing apparel had also been reduced, with the result that articles formerly beyond the reach of purchase except as rare luxuries could be bought by a greatly increased number and to an increased extent. The view as to the displacement of labour arose in the forties, when machinery began to increase the output before the markets had widened sufficiently, by means of transport and over-sea traffic, to absorb it. There was no doubt that over-production probably led to periods of depression such as that being experienced at present, but these experiences were not new, although the present depression was more universal than most of this generation could remember. This knowledge might be due to the wider view of the world, owing to the telegraph and the printing press; to the greater population in industrial centres, and to the sharp contrast between the improved conditions in prosperity, and the consequence of the idleness, especially when full advantage had not been taken by the habit of thrift. The hardship and distress experienced by large numbers of workmen and their families excited the keenest sympathy, and every effort was being made to improve the conditions. It should not be considered that the blame of the recurrence of trade depressions lay with the improved methods of production, otherwise there would be a stop to improvement, and it would be necessary to induce all nations to stay their hands. It would be impossible to arrest the irresistible ingenuity of mankind, or stem the inevitable progress of the race. It could be shown that improved mechanical methods had been beneficial to the worker from the monetary, physical and intellectual points of view. There was not a displacement, but a distribution of labour, due to increased mechanical methods. The lower price of articles due to the lessened cost of production increased the demand for such, and the higher average wage earned increased the purchasing power. The increased demand was met by a corresponding output, to meet which, machinery had to be produced, with consequent employment of labour in the manufacture, in the tending and in the repairing of the machinery; added to these were the works of transporting and erecting. The invention of the sewing machine was instanced to show that although a girl might do as much work as several tailors, getting higher wages herself, while she added to national wealth by saving on the cost of articles made, part of which went into the pockets of the wearers, the manufacture of the sewing machine added a new industry and gave employment to many and in many different branches. The demand for thread was increased and the large number employed directly by one firm alone, whose works in Paisley covered 100 acres, was stated to be 10,000, or, inclusive of agencies at home and abroad, a total of 30,000 persons.

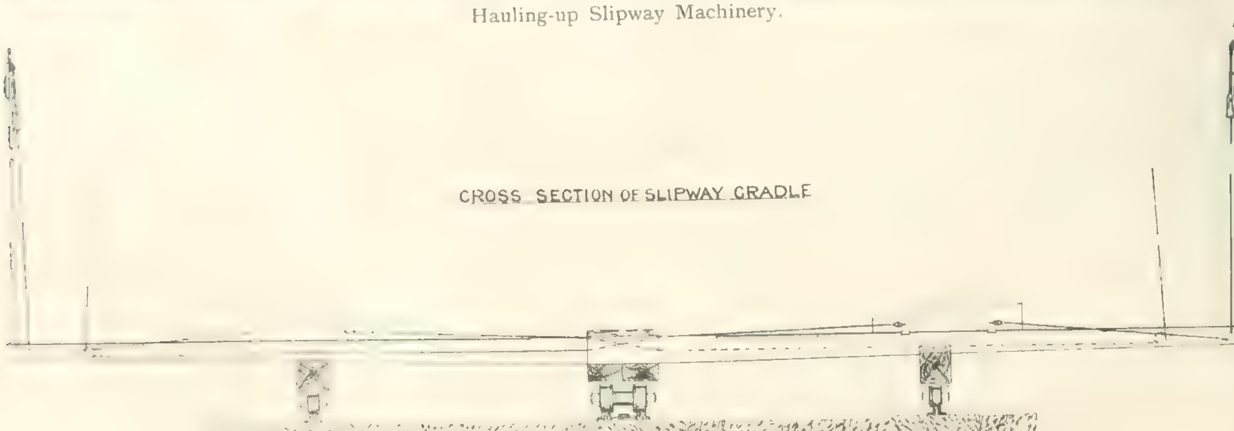
In the transport trade nearly 10 per cent. of the population was stated to be engaged, as compared with 2 per cent. in 1846. The crux of such a position was improved purchasing capacity. It was difficult to appraise the improvement in wages, but after careful examination of figures, the increase in the average standard wage for all workers was quite 30 per cent. over what it was in the sixties, and in some trades it was greater. The President of the Institute of Marine Engineers had given in his presidential address the increase in the average wage paid in the engine works of Messrs. Denny as from 14s. 10d. in 1852 to 35s. 7d. Similarly taken, the average wages in the shipyard had increased from 13s. 2½d. in 1852 to 32s. in 1907. Education was now free and the cost of the necessaries as well as the luxuries of life was less. House rent and taxes had increased and the conditions of life in thickly populated districts were not conducive to robust health and physique, to overcome which tendencies there had been a move to place factories in country districts, where the conditions were more favourable to the workers. The great help given by free libraries and means of education placed within the reach of all classes were remarked upon by Mr. Ward, also the privileges enjoyed now by the youth of the country compared with their predecessors, and in closing he impressed upon his hearers the necessity for early formation of high character in the rising generation, of high ideals and high aims, determined and resolute on aiming at perfection and high efficiency in all the work undertaken, thus emulating the example set by the greatest and best who had gone before.

HAULING-UP SLIPWAY MACHINERY.

MESSRS. Day, Summers & Co., Ltd., of Northam Iron Works, Southampton, have recently completed a set of hauling-up slipway machinery and cradle capable of dealing with a dead weight of 600 tons, at an inclination of 1 in 15, for the Milford Dock Co. This is the twenty-sixth set of similar machinery which this firm has completed, and the following particulars of the present set may be of interest. On reference to the illustration, which shows the machinery erected in the shops previous to despatch, it will be seen that it comprises a double cylinder horizontal non-condensing engine, having bar link reversing gear. The crank shaft carries a worm, which gears with the large worm



Hauling-up Slipway Machinery.



wheel driving the front shaft. This shaft carries a spur pinion, which by means of a clutch can be made to engage with the massive spur wheel on the main warping barrel. The barrel is grooved for the wire rope, and has ample surface to prevent overlapping of the rope. The front shaft, in addition to carrying the pinion and clutch, has a plain barrel mounted upon it for quick warping purposes preparatory to hauling up. The bearings are of ample proportions, and the bed-plate is rigidly tied by steel tie bars. The cylinders are 10 in. diameter × 12 in. stroke, and are supplied with steam at 80 lb. pressure from a vertical multitubular type boiler. The operations involved in hauling up a vessel are simple, and embrace the following: The cradle is run down the incline by its own momentum and submerged, the vessel is then floated on, the blocks hauled in, the engine started, and the vessel hauled up right away without any stoppages.

The second illustration shows a cross section of the cradle. The rails on which it runs are usually laid at an inclination of from one in twelve to one in twenty, but this varies with the site, and obviously the steeper the gradient the more powerful the machinery required.

The average time required for the operation of hauling up a vessel is twenty minutes after the blocks have been finally adjusted.

Last year, Messrs. Day, Summers & Co., Ltd., supplied to the order of Sir Alfred Jones a set of slipway machinery which can deal with a deadweight of 1,500 tons. This set being the largest they have constructed.

LAWSON'S PATENT VENTILATOR COWL.

THE ordinary form of cowl used for the ventilation of the compartments of a ship is often responsible for disasters by fire, owing to the fact that it has a perfectly clear opening, through which sparks from galley or main funnels, cigar ends, pipes, matches, etc., can enter the holds.

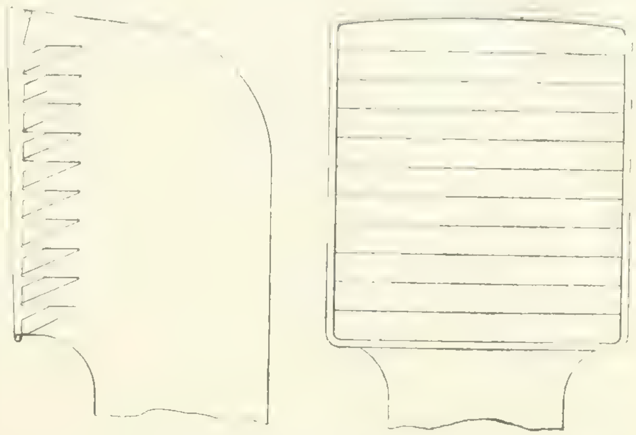
This is not a question of surmise, as the frequent presence of the above elements of danger under a ventilator pipe points to the grave risk involved to the ship, through carelessness or ignorance of danger caused by lack of experience of some passengers or members of the crew; added to this the open character of the cowls increases the risk to a much larger extent.

Attempts have been made from time to time to provide preventative means by fitting perforated plates on gauze wire diaphragms on the mouth or inside the ventilator pipe, but, while such devices may lessen the danger of fire, they do not prevent rain or spray going down the ventilator, besides which, in time, owing to the clogging action of dust, the air meets with such obstruction as to materially reduce the volume of air passing up or down.

A not uncommon precaution is to cover up the mouth of the cowl with canvas, to the detriment of the cargo.

A solution to this problem has been found in the fitting of a cowl as illustrated in the adjoining diagram.

It will be seen that in the mouth of the cowl is fitted a device which consists of a series of louvres, angularly disposed to the horizontal, so as to catch and divert any rain or spray in an outward direction, and the space between one louvre and another is protected by a perforated spark-catching plate arranged horizontally.



By this arrangement of perforations it is possible to provide an area of opening equal to or in excess of the total area of an open cowl, while at the same time, under ordinary conditions, no moisture can pass up such perforations, but, if present, can drip upon the inclined surface of the louvre and is discharged away from the interior of the cowl.

This cowl may remain face to the wind and the compartment get the full benefit of a down current of air under conditions when the other cowls would have to be covered up or turned mouth to leeward and thereby become non-operative.

It is interesting to note that the New Zealand Shipping Company, after a serious fire on board one of their steamers, decided to fit Lawson's cowl on the whole of their fleet.

These devices are being manufactured by Messrs. Silley, Weir & Company, Limited, 155, Fenchurch Street, London, E.C.

SILLEY'S PATENT SMOKEBOX DOOR.—This patented door has during the year made considerable progress, and we understand that something like 2000 have been fitted, which covers a large percentage of the boilers built for marine purposes in this country. In addition something like forty ships have been fitted in America, while the doors have been adopted very largely on the Continent. We are pleased to note that the five P. & O. steamers built this year are fitted with this invention, also that the new Orient Fleet, the Russian Volunteer Fleet and the new Flushing passenger steamers are also being fitted. We understand that the new White Star liners now building at Messrs. Harland & Wolff's are to be fitted complete with these doors. Messrs. James Howden and Co., Ltd., are the sole manufacturers, and put these doors forward with the installations fitted with their forced draught, which has greatly increased the output of the doors.

NEWALL'S RECORDICATOR.

THE constantly-recurring accidents to steamships, arising from a wrong interpretation of orders issued from the bridge to the engine-room, is greatly to be deplored and any invention which tends to lessen the risk of such accidents is worthy of investigation. When we add to these accidents, those of collisions between steamers, which, unfortunately, are happening every day, it becomes essential that something should be done to obviate them.

Mr. J. M. Newall, M.I. Mech. E., M.I. Mar. E., of the American Line, Liverpool, has solved this most difficult problem in a very simple and ingenious manner.

He has recently perfected a device at which he has been working for many months, which is perfectly simple and, we understand, thoroughly efficient. The general arrangement and operation of the device can be readily seen in the adjoining illustration.

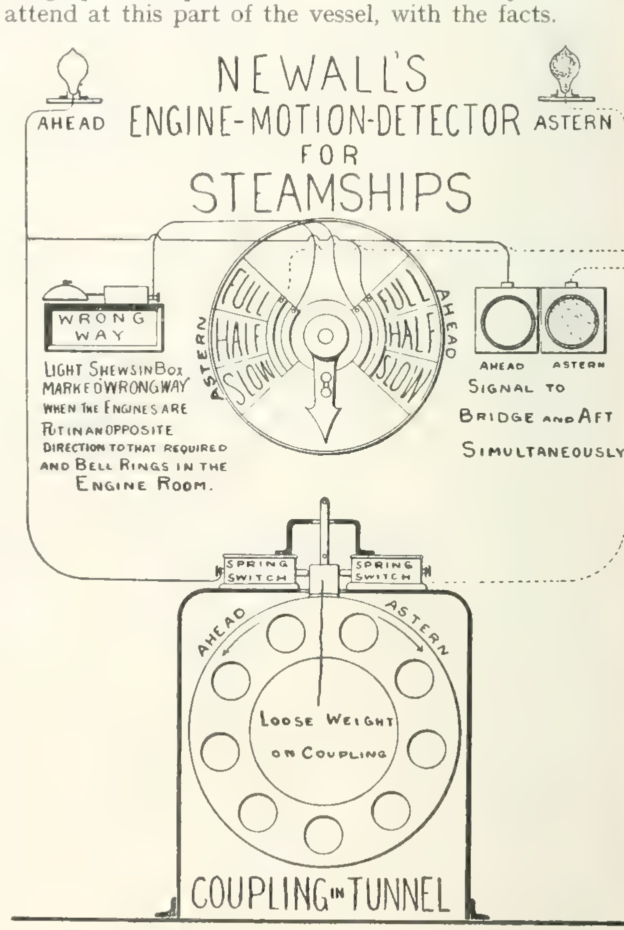
It consists of a switch at either side of a weight resting on a coupling of the tunnel shafting. The shaft, in revolving, tends to throw the weight sideways and puts into operation an ordinary switch and lights an electric lamp. On the shaft ceasing to revolve, a spring attached to the switch pushes the weight back into a mid-position, thus putting out the light. On the shaft revolving in an opposite direction, the weight is carried in that direction and puts into operation a similar switch, and lights another lamp. If, therefore, one lamp be red and one white, shown hatched and plain, respectively, only one of which can be alight at once, it follows that the direction in which the shaft is revolving can be detected in any part of the ship where a lamp is installed.

With this device fitted to a steamship, the navigating officer, in giving an order to the engine-room, will at once detect any irregularity in its execution, and will have time to warn the engineer that he is not obeying the order, before damage is done; whereas at present, he would have to wait and watch the result of his order in the movement of the vessel, which means a considerable time in some instances, and if a mistake has been made in the execution of the order, a considerable amount of damage is often done, which might have been avoided if the navigating officer had known in which direction the engines were moving. By this device, whenever the shaft moves, those on the bridge and after-deck are aware of it, no matter how little it moves, or in which direction.

At a steam trial of this invention on board the large passenger and cargo s.s. *Devonian*, of the Leyland Line, Liverpool, on the 10th of last month, it was demonstrated in a most interesting manner. On the engine-room telegraph indicating ahead, the engineer working the engines was asked to put the engines astern; this was done, and the moment the shaft commenced to revolve astern, a large notice "wrong way" was at once illuminated, and a very loud electric bell sounded. This visible and audible signal stood directly in front of the engineer working the engines. The telegraph was then put astern, and the engines moved ahead, when the same signal was put into operation and was kept going until the engines were put in the direction required by the telegraph.

On the navigating bridge a bracket is situated in front of the engine telegraph standard, carrying a box, with glass sides and top, containing two electric lamps, one red and one white. On giving the engine-room the order, "slow ahead," a white light comes into view. On giving the order "Stop," the light goes out, and on the order "Slow astern" being now given, a red light is instantly seen, showing at once that the engines are going in the required direction, and as long as desired.

A similar pair of lights are fitted aft, at the docking telegraph to acquaint the officer, whose duty it is to attend at this part of the vessel, with the facts.



A recorder, we understand, is also to be fitted on the *Devonian*, in conjunction with this apparatus, to record every movement of the propeller shaft. This instrument will be placed in the captain's room and the working parts will be kept under lock and key. A ribbon of prepared paper running over two drums, operated by a clockwork arrangement, receives the record.

On the vessel coming near to harbour and "Stand-by" being ordered, the Recordicator is placed in operation by the engineer. The moment he does this, the white light appears on the bridge and the recording instrument puts into operation a green pencil, which marks a perfectly straight line on the paper for as many minutes as the engines are going and until

they stop. As soon as they stop and for such time, nothing is being marked on the paper.

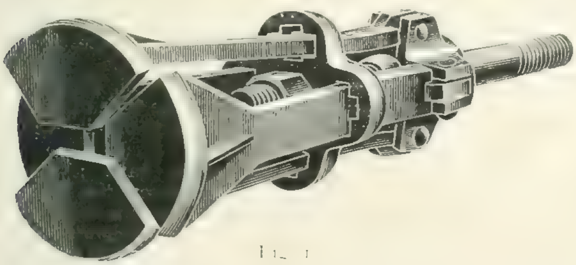
When "Astern" is asked for and given, a red pencil comes into contact with the paper ribbon and a straight red line is made for the time the engines are working in that direction, so that, no matter in which direction, and for how long, the engines are working, a true mechanical record has been kept of their movements.

This invention, therefore, becomes at once essential to every steamship, paddle or screw, if for no other reason than to keep a record which will, in the event of collisions, arising through fog, or any other cause, give to the owner, his representatives, or his legal advisers, authentic information as to what the engines were doing at the time of the accident, which information will be of the very greatest value in the event of the Admiralty Court being asked to decide who was to blame, and consequently, who is to pay.

We may mention, further, that no alterations or attachments are made to the engines, and so far as we know, the method of indication is unique, in so much that it is not in connection with the reversing shaft, gear or levers. It may, therefore, be applied to turbine shafts with the same advantages as to reciprocating engine shafts, and the number of signals may be increased and placed in any part of the vessel, and, finally, it will give to the marine superintendent and harbour masters, who are responsible for moving these valuable steamers in and out of dock, some indication of whether their orders are being carried out correctly, long before the vessel moves, the glow from the lamps at night being visible from the quay side.

BOILER ROOM EQUIPMENT.

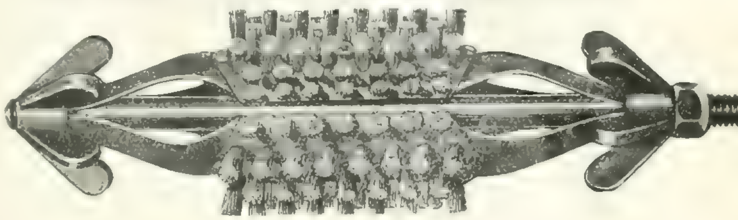
WHEN one reviews the position of our national characteristics, the elements which have built and hold our vast empire, the resources of the parent isles come vividly before one with the dominating factor of the coal supply in the foreground. The perhaps somewhat despondent views of many, with regard to future generations in a country bereft of fuel, have from time to time been urged



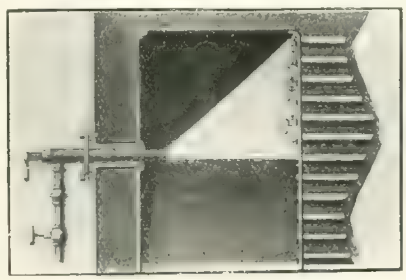
upon us, with the lament that the present age is wantonly wasting its birthright in criminal fashion, nay more, scattering it broadcast among the nations of the earth, not so evidently in exchange for a heritage for the future as for the luxuries of the times produced by rival powers. This is a question of social and political economics without the scope of these articles, and excluding the failure of the coal supply and even more imminently the oil supply, and neglecting the possibility or, as some suggest, the probability, of water-power electricity supplied from land to the ocean-going vessel, the concrete fact remains that to engineers, and more particularly marine engineers, the question of coal consumption is one of vital importance; for the essence of commercial success reduced to cargo-ton-miles per hour is almost entirely concentrated in the heat utilized in the fuel.

Although the present means available for transforming the heat into a convenient form for the production of mechanical energy must of necessity require the rejection of a large quantity as commercially useless, there is still a wide field to be exploited both in labour saving and in the economical use of the heat already available before commencing to battle with Nature for the remainder.

The contest between engine and boiler has so far been in the favour of the steam user; from the atmospheric engine to the turbine, and the waggon boiler to the water-tube, the race has been all on one side, and considering the energy put in at the furnace with that taken off at the stop valves, and the energy put in at the steam pipe with that taken off at the shaft the disparity between the ratios is only too



evident. The potentialities for improvement being thus obviously greater in the boiler there is no further necessity to emphasize the importance of the stokehold in marine economy. It is true that vast strides have been made, steps of progression which become longer and fleeter every day; it is also true that the conservatism, good in its way, which waits to follow other leads keeps many an improvement in the background long enough for it to drop out of the competition. It has been often the complaint that in spite of our advertising propensities the engineer often does not know of the many specialities on the market, or not having the opportunity of seeing and testing the devices does not



believe in them. That this is indeed the case has been frequently stated in public, and to meet this want the following descriptions may well be productive of good. To the junior, still in the way to acquire general information, the interest should prove educational; to the chief a more favourable view of innovations may be induced with suggestion of trial; to the superintendent, the adoption of anything tending to increased economy is eminently worth consideration and the descriptions may serve as an illustrated directory of boiler plant specialists.

Until it is possible to obtain perfect combustion with the elimination of soot-depositing smoke so long will the efficiency of the boiler be impaired by the choking of the fire tubes. Wherever the hot gases are cooled below their perfect combustion temperature, before the carbon is completely burnt to carbon dioxide, smoke and consequently soot will be produced, as where the gases immediately come into contact with the water cooled plate or tubes. There is a remedy by employing an external refractory furnace, so that complete combustion is secured, but this, though feasible in land installations, has no place in the space limits of the marine stokehold. Given then that soot is an evil to be dealt with separately on its own demerits, measures are necessary for its removal and prevention of accumulation.

SIMPLEX TUBE CLEANER. Bromell Patents Co., 21, Hope Street, Glasgow.—As shown in Fig. 1, this scraper has four arms, formed from solid cast steel stampings, these are

jointed to a boss, through the centre of which a half-inch rod passes loosely. The outer end of this rod is screwed to fit the socket of the handle rod, the inner end being screwed into the sliding sleeve which embraces the four arms, and is secured by a jam nut. When this sleeve is pushed by the rod towards the scraping disc, the arms are brought close together, and the cleaner can be passed loosely through the boiler tube. As the rod and sleeve are drawn back, when pulling the cleaner through the tube, the arms expand and the scraping edges are pressed against the tube walls, thus removing soot and scale and drawing the obstructions into the smoke-box.

The central rod is provided with a collar which butts against the inside of the boss, the sleeve being thus capable of adjustment along the arms by screwing the rod in or out; the amount of expansion of the cutters can be regulated as necessary, so that the soot only need be removed while steaming and the hard caked scale can be cleaned out when the fires are off.

SIMPLEX STEEL TUBE BRUSH. Bromell Patents Co., 21, Hope Street, Glasgow.—The ordinary type of spiral wire brush after a very short time becomes too small to efficiently sweep the tubes, owing to the wear and tear on the bristles. This objection has been overcome by the brush shown in Fig. 2. The bristles are of hardened steel wire, machine-riveted into the supporting plates. These plates are attached to flexible steel arms, there being three arms on each brush, the

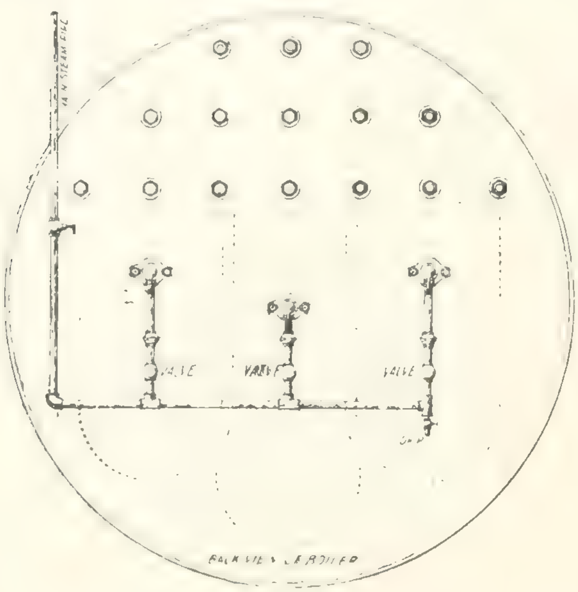


Fig 4.

ends of which are curved to suit the central rod and fit into a recess in the fly-nuts. The diameter of the brush is thus adjustable by means of the fly-nuts and can be increased till the bristles are completely worn flush.

DIAMOND TUBE BLOWER. Power Specialty Co., 234, Fort Street West, Detroit, U.S.A.—This is a device which cleans the soot from the tubes by blowing a jet of steam at high velocity from the combustion chamber end of the boiler. The attachment of the apparatus is shown in Figs. 3 and 4. One blower is fitted at the centre of each nest of tubes, boiler steam is supplied to each by means of a main and branch pipes with stop valves. Nozzles are so arranged in the blower that a steam blast is projected into the boiler tubes as seen in Fig. 3. This blast is slowly turned upon all the tubes in the nest by rotating the handle at the left end of the blower. A spring is fitted round the stem at the handle; when steam is turned on the nozzles are pressed in towards the combustion chamber, compressing this spring, and when steam is shut off the spring draws the stem back, this preventing the nozzles being burnt by the hot gases. As the apparatus is a fixture on the boiler back, no obstruction is caused, and as all that is necessary is to turn on steam and rotate each handle once the labour is negligible, and a few minutes is sufficient to complete the operation.

INTERNATIONAL CONGRESS AT PARIS.

(*Continued from page* 159.)

Section V.—*Continued.*

M. F. W. J. Moore (Tasmania) continuing on the subject of fruits, pointed out that with increased care and attentive study it would be possible to store any kind of fruit and take it from the cold store at any period of the year with all its qualities unimpaired, by the use of self-registering thermometers and chemical analyses of the atmosphere of the store house. Since 1880 Tasmania had taken an important part in the cold storage and transport of fruit, and it was only by careful study of the best conditions that such a trade would develop. The climate of a fruit-growing district affected the conditions greatly, a dry climate being conducive to good carriage. The avoidance of exposure to the heat of the sun, or to atmospheric conditions on the wharves was urged, in the course of shipment.

M. Nickerson and other members entered into the discussion of these papers, which dealt with highly important details.

The meeting on Oct. 7th was opened by M. Nickerson in continuation of the carriage of fruit, and he complimented M. Powell on his valuable paper; he was followed by other members who continued the discussion and M. Powell replied.

M. Henriet then gave a brief statement on the history and development of the frozen produce industry, and was followed by M. Bureau, who pointed out that the district around Lyons was well suited for the cultivation of agricultural produce and could be developed with great advantage by the establishment of means of transport under refrigerated conditions; he urged that such should be kept in view by a resolution on the subject. M. Von Wendrich (Russia) remarked upon the trade between Russia and France in refrigerated produce, and how it could be made much more useful by a better organized system and more facilities. M. Bureau pointed out that the military authorities might with advantage to all concerned study the subject of refrigerated produce, and adopt such means as would enable them to take advantage of the means and extend these to obtain food for the army, however and wherever situated in peace or war. After a few remarks by M. Bureau the meeting was adjourned.

On Oct. 8th M. Segré submitted a paper on the Italian railway traffic in refrigerated produce, butter, cheese, meat, poultry and eggs, besides fruits of various kinds. The transport charges were referred to as low as possible, and that to encourage the trade this policy was a good one for the community. After some remarks by M. Henriet and M. Dugit-Chesal on the transport arrangements made by the railways, the discussion was continued by M. Omer-Decugis, and the President of the section as to quicker despatch being granted by the railways for perishable produce. M. Villain and M. Velluz followed with questions and references to the wagons in general use for refrigerated produce. Further discussion ensued and was taken part in by M. Desies, M. La Gogué and others, mainly dealing with the type of wagon, treatment in transit, expedition and other details which might be improved to facilitate the trade.

At the afternoon meeting M. Larsen gave a paper descriptive of the refrigerated cars in use on the Danish railway, and desired to know what arrangements were considered most suitable for the transport of refrigerated products. M. Vellur and the President continued the subject, and a resolution was submitted and passed to the effect that the whole question of transport should be considered by an international committee with a view to joint action and arrangement by the railway companies to meet the requirements. M. Henriet spoke on the subject, urging attention to the whole of the details connected with the transport service to facilitate progress. M. Fleury called attention to an arrangement which was exhibited and has given very good results on vessels trading in the Mediterranean and was equally applicable for land transport. M. Bloch urged the desirability of having storage accommodation at certain ports of call and regular service for the transport of produce. M. Kolischer continued the subject, referring to Mr. Carry (Chicago) and M. Powell and their contributions to the general information on wagon construction for the

carriage of refrigerated produce. After some further remarks by M. Dabrawici (Rome) and M. Bloch, a resolution was presented and adopted to the effect that action should be taken with a view to provide and maintain better facilities for the transport of refrigerated produce. M. Ricard and M. Kolischer added their views on the subject, pointing out what had been done in the carriage of produce with proper means and there was no difficulty in carrying out the arrangements proposed to improve the facilities.

On October 9th, M. F. W. J. Moore (London) gave a paper on the carriage of fruit and the importance of a well-arranged system of ventilation with self-registering thermometers. Mr. Guerrero (Argentina) remarked upon the importance of extending interest in the importation of produce from Argentina to Europe. M. Backauser pointed out that the Brazilian Government were deeply interested in the transport of refrigerating produce. Considerable discussion ensued on the subject of transport wagons, and several resolutions were passed.

On October 10th, Mr. J. T. Milton read a paper on the sea transport of refrigerated cargoes, in which he sketched the changes made in the machinery from cold air to ammonia and CO_2; methods of insulation; temperatures most suitable for the different kinds of produce and the stowage of the frozen carcases to give best results. A paper by M. W. Lund was read in his absence by Mr. R. Balfour dealing with the risks in connection with the carriage of refrigerated produce; 180 steamers having a capacity of 750,000 tons, or 12,000,000 carcases of frozen mutton were now employed on long voyages. M. Danis (Engineer Comp. Gen. Transatlantic, Paris) gave a paper on isothermic plant for the transport of fruit, referring to the compressor and connections, store compartments and ventilators. A discussion ensued on the merits of the ammonia and CO_2 machines, which broadened out to cover the conditions favourable to the carriage of different kinds of produce.

Section VI.—Amphitheatre Quinet.

The meetings of this section were opened on Wednesday at nine a.m. by M. A. Raffalovich (Russia), who presided, by explaining generally the objects of the congress and particularly those of the section, *viz.*, to promote the establishment of legislation with a view to extend the use of refrigerated produce by enactments which will be for the general good of producer and consumer, and give confidence to the public that their interests are well attended to. M. de Denissof submitted a resolution urging that every encouragement should be given to the introduction of refrigerating machines into different countries, where they would be found of great advantage. M. G. Anderson (New Zealand), after a few remarks on the desirability of inspection of produce being well organized and carried out, proposed a resolution to the effect that in view of the great expansion of the trade in refrigerated produce a standard of inspection should be established and agreed to universally to ensure the good conditions of meat and other produce. M. Raffalovich remarked on the necessity of having legislative action on the subject carefully carried into effect, and a resolution was added to the former two and carried that measures be adopted for the formation of authorized regulations in different countries exporting or importing refrigerated produce. The Secretary submitted a paper by Prof. W. Anderson (Liverpool), dealing with the teaching of the principles of refrigeration in the University of Liverpool and the advantages given to the students. It was considered that both technical and commercial schools should teach the subject.

M. B. de Gontcharoff (Russia) gave a paper embracing a note of the papers published in Russia on the refrigerating industries. M. Raffalovich advocated the publication and spread of such information in the different countries. M. Christen (Basel) described what has been done with regard to the trade in frozen salmon and the restrictions placed upon it. He pointed out that some definite understanding should be reached to provide for the close season of fishing, especially in view of the extension of the Canadian salmon trade. Considerable discussion ensued, and it was agreed that the subject should receive attention from the authorities. M. the Hon. T. A. Coghlan (New South Wales) pointed out the importance of facilitating as far as possible the introduction of refrigerated meat to congested districts from countries where animals were easily pastured, and submitted a resolution advocating that regulations which hamper international trade in refrigerated produce should be modified so that facilities might be given to the introduction of such produce, and thus enable the poorer classes to obtain meat more readily and at a lessened cost. M. Raffalovich supported, and proposed a further resolution with a view to the establishment of simple and uniform regulations to carry out an extension of the trade. M. M. Malaquin submitted that any regulations which specially affected the restriction of refrigerated produce applied to other provisions. M. de Denisoff presented the closing resolution, advocating the appointment of an international commission to deal with the whole question, from the different points of view expressed on the subject. M. d'Alvéar (Argentine) submitted a series of resolutions bearing upon the inspection of animals and the establishment of rules and regulations, with complete arrangements for carrying these out. Some discussion ensued on the subject of game and the laws regulating such during the season. This resulted in a resolution on the subject with a view to regulate the trade to cover all the conditions necessary. Other resolutions bearing on the industry and suggested by various papers read in the different sections were passed, and the meeting adjourned. On the following day M. Cavenaghi Félix, after remarking on the encouragement given by the authorities in different countries to the industry, proposed a resolution that legislation should give encouragement to the use of ice which is made under the most favourable conditions of manufacture. M. Raffalovich then submitted a resolution bearing upon the improvement of the transport service of produce across the continent between Russia, Germany and Austria. M. Gen. de Wendrich urged the importance of this subject, and the resolution was adopted. M. Delpont advocated by resolutions the establishment of refrigerated store houses to give full scope to the development of the trade in frozen produce. M. Kalantar (Russia) pointed out the difficulties in the passage of frozen produce on the frontier, and submitted a resolution proposing a modification of the present system to facilitate transport of produce. After some remarks by M. Le Roy and M. Ancelot, Sir Montague Nelson presented a paper by Mr. P. B. Proctor (London) giving statistics bearing upon the imports into Britain of refrigerated produce,—meat (544,723 T.), rabbits (34,646 T.), butter (210,821). The large amount imported affected the market and reduced the cost to the consumer, thus placing within reach of the poor, articles of diet which would otherwise be too high in price. The removal of tariff restrictions in certain countries would no doubt follow, as the people realized what benefits would be gained by them by the importation of frozen produce. An interesting series of propositions was directed to the president by the members representing Argentina, and a resolution of thanks to the Government of France for the position and interest taken in the subject of the Congress and its promotion. An International Conference followed, and it was proposed to establish a society with the name "International Association of Refrigeration." An invitation was received to hold the congress at Vienna in 1910.

JOINTING.—The important function fulfilled by a good jointing material is such that every engineer is always on the look out for the best he can obtain, as leakages, whether of steam or water, are exceedingly troublesome in general practice, while in the case of ammonia or other media used in connection with refrigerating plant they are more than troublesome. The jointing materials which were made to serve the purpose until within a few years ago were gradually displaced by others, manufactured to meet the higher pressures of steam, the more severe exactions of service and the necessities which compelled the saving of fresh water by all possible means. Among the best of the materials recently introduced to suit the exigencies of all the conditions of work and service for steam, water or refrigerating machinery, the jointing sheeting called Tauril has been highly spoken of and commended to our notice. It has a high tensile strength, being tough and durable, and is said to withstand a compression of fourteen tons without losing its elasticity. Messrs. Ferguson & Timpson are agents for this material.

LIVERPOOL MARINE ENGINEERS AND NAVAL ARCHITECTS.

THE tenth annual dinner of the Liverpool Marine Engineers and Naval Architects was held on December 9th in the Exchange Station Hotel Liverpool. Mr. Geo. A. Harradon presided, with Mr. A. J. Maginnis as vice-chairman. The loyal toasts were proposed and received as befitted the occasion. "His Majesty's Forces," as the first following toast, was proposed by Mr. W. Scott, who remarked upon the style of building and equipping war vessels at the present day, compared with the obsolete and earlier types, eulogising the design and work of the naval architect and the engineer in bringing about the improvements made from time to time. In acknowledging the toast, Captain Fraser, R.N., expressed the view that in a more enlightened age the aim of civilized communities would be for the welfare of man, and in carrying out that aim the naval architect and engineer would ever play an important part, as to them were largely due the progress which had been made in bringing nations nearer to one another and giving readier access from one country to another. The steamship trade of Liverpool was the subject of the toast proposed by Lord Mountmorres, who pointed out the important bearing the steamship trade of the Mersey had, not only on Liverpool with its varied interests, but also on the nation. Commenting on the work of the Dock Board, Lord Mountmorres coupled the toast with the name of Mr. Chambers, and referred to his connection with the Board. Mr. Chambers, in responding, agreed that the importance of the subject was not exaggerated. While increase in the number of steamers added to the importance of the port, and but for the steamers the need for docks would disappear. Commenting on the growth of Liverpool he quoted from some of the earlier directories, dating from 1870, to show the great increase and the changes which had taken place in the shipping community and the interests connected therewith specially noting the introduction of the naval architect and consulting engineer on the scene. "The Liverpool Marine Engineers and Naval Architects" was next submitted by Dr. J. G. Crawford, and Professor Watkinson, who urged that the steps which had been proposed and advocated on several occasions should be taken of establishing a chair for naval architecture in the Liverpool University. There was no question as to the importance and desirability of having a place in the curriculum for the study of naval architecture; the one difficulty was a financial one, but seeing that other centres and other nations were provided with facilities such as he advocated, surely it might be considered that Liverpool was even more needful of these facilities. The establishment of an experimental tank, where not only form of body for given speeds and displacements could be tested, but shape, pitches and diameters of propellers at different revolutions could be experimented with, although costing a considerable amount of money, would prove of immense value and a saving in providing data for the building of large vessels, and, in closing, Professor Watkinson appealed for help to further the plan proposed of establishing a chair. After "The Guests" and "The Chairman" had been duly proposed and responded to, the pleasant evening was brought to a close by the company joining in "Auld Lang Syne." The dinner committee consisted of Messrs. W. Beatson, John Wall, N. N. L. Shubrook, W. Scott, G. Thompson, with Mr. G. Nelson acting as hon. secretary and treasurer. During the evening Miss Mira Dudley, who, we understand, is closely connected with engineering families, had the honour of singing to the assembly and was much appreciated.

ANDERSONS' SIMPLEX OZONE PRODUCERS.—In the Banqueting Hall of the Exchange Station Hotel on the occasion of the Annual Dinner of the Liverpool Marine Engineers and Naval Architects, three Ozone Producers were temporarily installed for the purpose of assisting the ventilation and purifying the air, and as a practical demonstration of the possibility of producing Ozone, for the purification of the air, by electrical methods, cheaply and efficiently; it proved an undoubted success.

INSTITUTE OF MARINE ENGINEERS.—The adjourned discussion on Mr. Robert Bruce's paper on "Some Recent Developments in Surface-Condensing Apparatus" was held before the members of the Institute of Marine Engineers in the London Institution, Finsbury Circus, on Monday evening, December 21st. Mr. John McLaren (member of Council) presided. The Hon. Secretary read a communication from Mr Jas. Anderson, who stated, with regard to Mr. Bruce's advocacy of compartmental drainage, that if it were possible to have water in the condenser which contained no air and to have no air leaks, the vacuum would depend entirely upon the temperature of the hotwell, and therefore there was no reason why, with a well-designed condenser and a good set of pumps, the vacuum should not be as completely under control without compartmental drainage as with it. With regard to the figures given by Mr Bruce of 1 square foot of cooling surface per I.H.P. being required in the new type of condenser described by him, as compared with the $1\frac{1}{2}$ square foot of the ordinary condenser, he submitted that the extra $\frac{1}{2}$ square foot found in ordinary practice was an insurance against faulty tubes and coatings of grease. Mr. D. B. Morrison said that in making improvements on the ordinary condenser he had extended the baffles, and by reversing the flow of the steam in a tubeless passage had obtained a uniform distribution. In the ordinary condenser as the steam fell the air richness increased as the temperature decreased, and the air had a prejudicial effect upon the surface efficiency of the tubes. To get the best efficiency the air pump should always dominate the condenser. The object of the water cooler was to make the pump exactly the size the air leakage demanded, and thus to obtain the hottest feed-water possible with a given air leakage and a given size of pump. Where the air leakage was considerable the effect of the cooler was to raise the vacuum in some cases by as much as three inches. The hotwell temperature depended entirely upon the quantity of air in the condenser and the efficiency of the air pump, and in that respect an air gauge should be used to determine the relative air-tightness of the apparatus. Referring to the trials of the s.s. *Otaki* and a sister ship, Mr. W. P. Durtnall asked if comparative figures could be given as to the effect of the increase in vacuum obtained by the condenser in one of the vessels over that of the other upon the coal consumption. Professor R. L. Weighton referred to the extreme sensitiveness of the surface condenser, and in illustration he assumed the case of a condenser with a vacuum of twenty-five inches, and the temperature of the circulating outlet water at ninety degrees. If the thermal conductivity of the tubes were improved to such an extent that the heat-transmitting powers of the tube surface were increased so as to raise the temperature of the outlet water by merely half a degree, it would cause a rise in vacuum from twenty-five to twenty seven inches. It was, unfortunately, just as sensitive to degradation, and the slightest increment of air leakage would cause the two inches of increase to disappear, although the temperature of the outlet water might be only very slightly decreased. This sensitiveness of the condenser threw the responsibility of its success or failure, especially of modern types, upon the sea-going engineer. There were two ways of improving condensers, one by increasing the pumping power, thus permanently increasing the working expenses, and the other by the disposition of the surface inside so as to determine the flow of steam and water in a special direction, and in a condenser improved in this way there was no increase in the working expenses. The accumulation of grease referred to by Mr. Anderson did not affect the proportional efficiency of the tubes in the instance mentioned. Mr. P. S. Doherty asked for particulars respecting the comparative cost of the new type of condenser mentioned by Mr. Bruce as compared with other types, and also, for the purpose of comparison, if the author could give particulars as to the size of the air pump, the tightness of the tubes, and other outside circumstances which might conduce to the increased efficiency in the instances mentioned. Mr. John Elliott was of opinion that the tubeless passages and other facilities for drainage advocated by Mr. Bruce did not give better results than were obtained from the types of condenser at present in use, and he quoted relative performances of condensers in support of his contention. Mr. Durtnall commented upon the relative weights of condensers as being an item worthy of consideration. It was decided to adjourn the discussion till Monday, January 4th, the meeting to be held at the premises of the Institute, 58, Romford Road, Stratford, E. The meeting terminated with votes of thanks accorded to Mr. Morison and Professor Weighton, and to the Chairman

ELECTRICITY ON BOARD SHIP

XX.*

By Sydney F. Walker, R.N., M.I.E.E., Assoc. M.I.C.E., etc.

The Plunger Lamp Holder.

By far the greater number of lamp holders employed, are made upon the plunger pattern. Parts of the latest form of the plunger lamp holder are shown in Fig. 6 and 7. As will be seen, there is a brass tube, with slightly decreased diameter at one end, the end into which the lamp cap fits, and with a bayonet joint cut in that portion. By a bayonet joint is meant a slot cut at opposite ends of the diameter of a cylinder, or ring, the slot taking the peculiar form shown in the drawing, and which takes its name from the fact that it is the method employed for holding the bayonet on the end of a rifle. As will be seen, the slot enters parallel with the axis of the lamp holder, then turns almost at right angles, and then opens slightly. A recess is thus formed, such that when the pins upon the lamp cap are pushed into the straight portions of the slots, they are given a slight turn to the right, and are then released, the pins falling into the curved recesses, and being thereby locked. Inside the larger portion of the brass tube is held a disc of porcelain, carrying two small plunger contacts. The plunger contacts consist of two small barrels, into which two small pistons enter, the inner portions of the barrels being occupied by small spiral springs. The spiral springs force the plungers outwards, and the object of the arrangement is to ensure good contact between the terminal plates on the bottom of the lamp caps and the plunger contacts. Attached to, and forming part of, the small plunger barrels, are terminal screws, as shown, consisting of lugs with holes drilled through them for the connecting wires to enter, and with screws at right angles to tighten them up. The porcelain disc, with its plunger contacts, is held in position by the cup-shaped back of the lamp holder, which again is fixed to the front portion, by the screwed brass ring shown. It will be noticed in the illustration that there is an S-shaped piece of porcelain, surrounding the plunger contacts. This is the latest form of the plunger lamp holder, and the S-shaped piece of insulation has been introduced in order to prevent sparking between the two contacts, with the higher voltages employed in the electrical distribution service. With 100 volt. services, the plungers in the lamp holders were merely fixed upon the porcelain discs, and were not protected from sparking, and there was usually no danger of sparking from one to the other, but with 200 volts and upwards there is a distinct danger of this taking place, particularly when a number of lamps are turned out in other parts of the ship, and therefore, if and when 200-volt lamps are employed on board ship, if

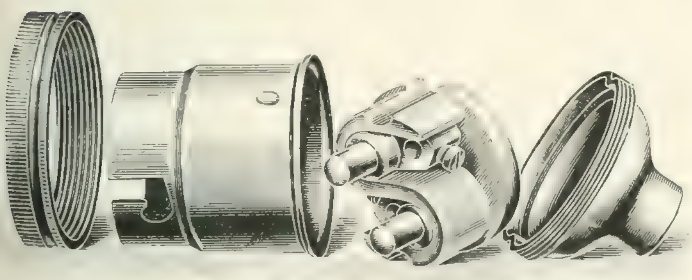


Fig. 6.—Parts of Double Contact Lamp Holder, made by the General Electric Co.

plunger lamp holders are used, some protection will be necessary between the contact plungers. The complete lamp holder is shown in Fig. 8, and a lamp in its lamp holder in Fig. 9. The back of the lamp holder, it will be noticed, is also tubular and has a female screw cut on its inside. This enables it to be fixed upon the end of a lamp bracket, or anything else having a male screw, and the usual arrangement is, the service wires are led to a substantial bracket, formed of a tube, and ending in a tube with a male thread, the lamp holder being screwed on to it. For board ship work, this arrangement, the lamp holder screwing on to a fixed bracket, is undoubtedly the best, and the most commonly used, but for hanging lamps, such as are very much used on shore, and such as might with advantage be used on board ship, in ships that do not knock about much, the lamp holder is extended to carry what is termed a cord grip, a couple of pieces of wood, arranged to clasp the flexible cords by which lamps are suspended, the wood being held by a brass fitting

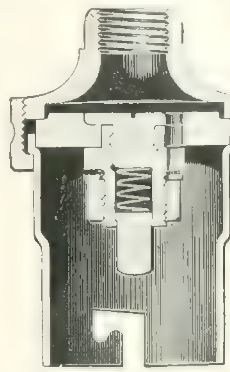


Fig. 7.—Section of Central Contact Lamp Holder, made by the General Electric Co.

screwed into the back of the lamp holder. In addition to this all lamp holders are arranged to carry shades, and for special purposes to carry protecting fittings. The shade-carrying lamp holder is made rather longer than one that is not intended to carry a shade, and it has two screwed rings in place of one. The ordinary lamp holder of this type, it will be remembered, has one screwed ring to hold the parts of the lamp holder together. The shade-carrying lamp holder has a second screwed ring in front of the one which holds the lamp holder together, the body of the lamp holder being screwed on the outside to hold the second ring, and the shade is slipped between the two rings, the second ring holding it in place against the ring which holds the lamp holder together. Lamp shades on shore are of all kinds of patterns, a favourite one being conical, of white or green porcelain, and for workshops and places of that kind, of enamelled iron, the outside being enamelled blue, and the inside enamelled white. The object of shades with incandescent lamps is to obtain the benefit of the light rays that are lost in the ordinary arrangement of the lamp. When a lamp is suspended vertically, the rays from the filament pass out in all directions, the principal portion passing out to the sides, but a considerable portion passing upwards. The shade placed above the lamp reflects the rays passing upwards, and so increases the amount of

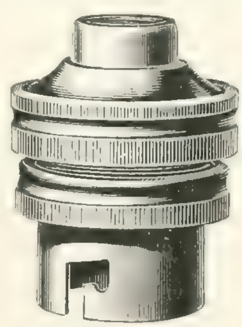


Fig. 8.—Form of shade-carrying Lamp Holder, made by the General Electric Co.

light given by the lamp in the useful direction down-wards. A point may be as well noted here, *viz.*, the shape of the lamp. Marine engineers are familiar with the ordinary pear-shaped lamp, and they will be aware that it has one serious drawback, *viz.*, that owing to the presence of the point of the globe, where it is sealed off when the lamp is made, not much light is given directly below the lamp. As mentioned above, the bulk of the light is thrown around the lamp at the sides. A number of lamps are now made, known by various names, in

* For Articles I. to XIX., see previous issues.

which the globe is made of a flattened shape, like two saucers placed one on top of the other, the filament being altered in form accordingly. More light is given downwards by this form of lamp than by the ordinary pear-shaped form. An adjunct to this form of lamp that is often used is a reflector directly covering the upper portion of the lamp, what may be termed the upper saucer. In some lamps the upper portion

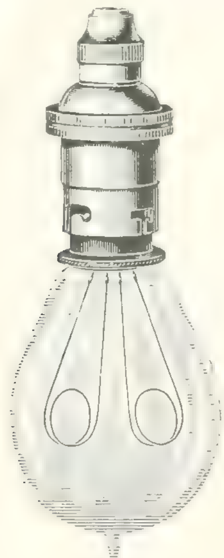


Fig. 9.—Lamp and Lamp Holder complete.

of the globe is silvered when the lamp is made, the silvering forming the reflector. In other forms a porcelain saucer is arranged to be slipped over the upper portion of the lamp and to form the reflector. The great advantage of the movable reflector is, of course, that it is not lost when the lamp is used up.

In the next article the writer will deal with the methods of holding lamps on board ship, for different purposes.

AN order for a new fast motor launch for Japan has been placed wlth Mr. James A. Smith, M.I.N.A. Plans for a smart new 28 ft. sea-going steam launch for a London owner have also been prepared by the same designer.

THE EDWARDS AIR PUMP SYNDICATE, LTD.—Notwithstanding the severe depression which has existed in shipbuilding during the greater part of 1908, the Edwards Patent Air Pump has been fitted to more than 300 steamers; many of them being twin-screw vessels of large tonnage. The simplicity and reliability of the Edwards Pump render it specially suitable for marine work where minimum cost of upkeep and freedom from breakdowns are essentials. It has now been fitted to over 3000 vessels, including a large number of turbine steamers, for which the highest possible vacuum is required. The position of the Edwards Pump as the standard air pump for land installations has long been established, and during 1908 it has been adopted for many large condensing plants for use in connection with turbines of the Parsons, Curtis, Zoelly, De Laval and other types. The total number of pumps booked up to date exceeds 8100.

THE INSTITUTION OF CIVIL ENGINEERS: STUDENTS' MEETINGS. At the Students' Meeting held at The Institution on Friday the 18th December, at 8 p.m., Mr. E. P. Hill, M. Inst. C.E., in the chair, the Paper read was "High-Power Water Turbines on Moderate Falls," by R. Woldenden, M.Sc., Stud. Inst. C.E. The paper, which was illustrated by lantern slides, described briefly the various types of impulse and re-action turbines and their regulation, and discussed mathematically the design of mixed-flow and radial inward-flow turbines. In the subsequent discussion, the following gentlemen took part: Messrs. A. Caldwell-Smith, C. J. Guttmann, D. G. French, G. Lacey, G. Lovegrove, A. S. Quartermaine, D. H. Thomson, F. W. Cockshott and R. C. Wells. The chairman in summing up referred to the benefit derived by turbine users from the construction of reservoirs for water-supply.

ON HEAT LOSSES.

(II.)

(*Continued from page* 48.)

THE head and chief of preventable heat losses is the condensation which takes place while steam is being admitted to the cylinders. With the progressive rises in pressure there has been a corresponding increase in piston speed, and as high piston speed enables considerable reductions to be made in the size and weight of engines, with prices cut fine in the keen competition for orders, engine builders are driven to adopt it, and cases are known of ordinary cargo boats with piston speed up to 900 ft. per

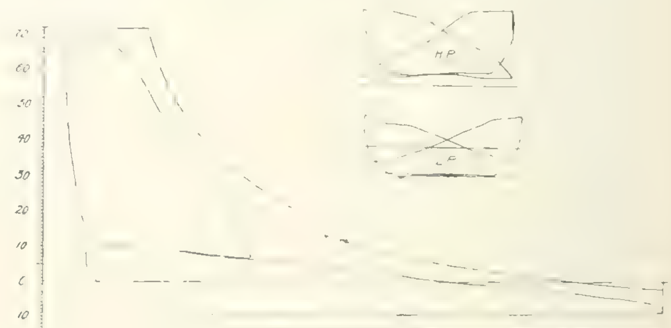


FIG 1

minute. By way of excuse for fitting these modified destroyer engines it is claimed that initial condensation losses are thereby reduced, and this statement, with little or no evidence to support it, is generally accepted as correct.

Just what the statement is worth can be gathered from an inspection of the adjoining diagrams. Fig. 2 represents the combined cards from a tri-compound of the best class at 85 per cent. of full power. Piston speed, 600 ft. per minute; valve travel, 7 in.; working pressure, 180 lbs. Fig. 1 represents the combined cards taken recently from a compound

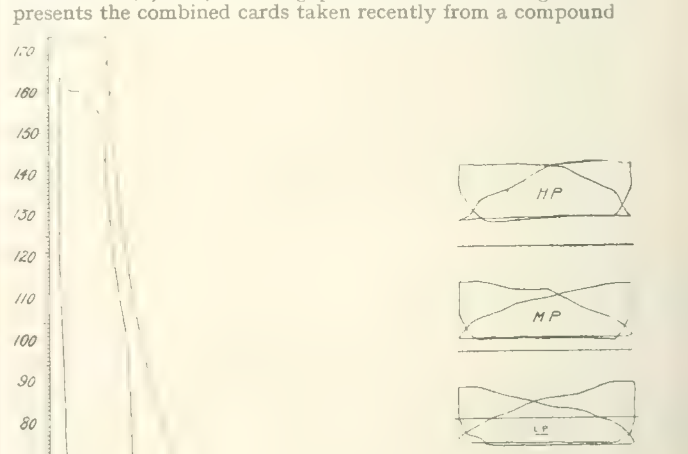


FIG. 2

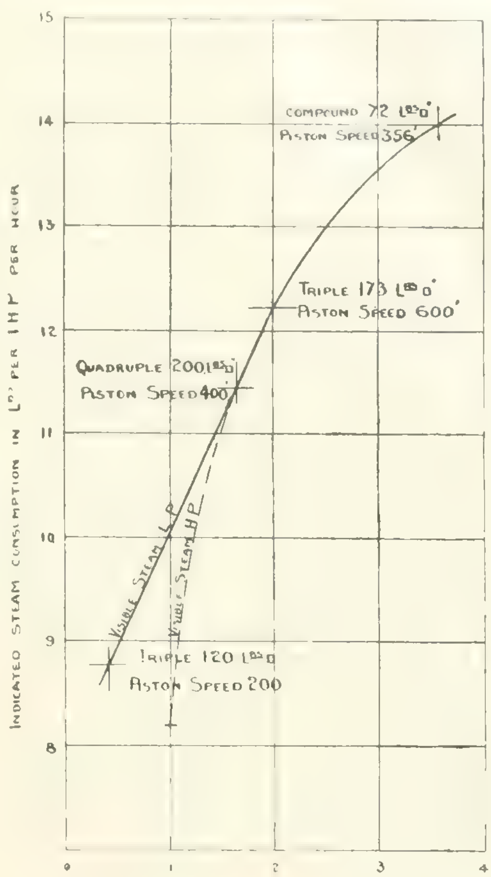
over twenty-eight years old, also running at 85 per cent. of full power; piston speed, 356 ft.; per minute valve travel, 3⅝ in.; working pressure, 75 lbs. It will be recognised that here we have everything that is bad, from the point of view of advocates for light, high piston speed engines, and if there was anything in their theory the initial condensation loss in the triple ought to be about half that of the two stage compound, yet we find at cut-off point, which is at ·35 of the stroke in the compound, the dryness fraction there is ·75, while the triple with a much later cut-off, *viz.*, ·52, the fraction is ·83. We have here 40 per cent. increase in piston speed, wide ports, almost double the valve travel, friction load increasing directly with the revolutions, and friction resistance at propeller increasing as the square, and against all this the initial condensation loss is only 8 per cent. less in the triple than in the compound, although the former has the advantage of a later cut-off with a corresponding reduction in temperature range. As already mentioned, high piston speed is the simplest way to reduce size and weight of engines, but when everything is taken into consideration the question arises whether, in the mercantile marine, this reduction in weight is not being carried to excess, and being paid for too dearly. And this holds good in many ways. Our aim is to obtain the maximum of work with the minimum expenditure of heat, but it appears as if designers purposely and deliberately went out of their way to handicap steam. The ordinary triple engine takes its supply from a boiler, usually pushed to its utmost, with forced draught, and consequently we get a semi-fluid mixture in the receiver ready to condense at the slightest reduction in temperature. It comes in contact with the slide valve, the main body of it always exposed to exhaust temperature, it enters the port which for half a revolution has been filled with exhaust steam, and about ·5 or ·6 of the stroke the supply is cut off.

It is then expected to expand according to known laws in a cylinder surrounded by a belt containing exhaust steam!

With the known readiness of steam to part with its heat, when the above conditions are carefully examined, it is easily seen that the effect of high piston speed is more likely to be detrimental than beneficial, because speed alone cannot alter the temperature equilibrium, through the port and other surfaces being alternately exposed to a high, but rapidly varying, temperature for a short period, and to a low and constant temperature for double that period, during each stroke.

This method is equally as wasteful of heat as when, a hundred years ago, steam was condensed by spraying water over the cylinder. The only difference is that the amount lost per stroke has been reduced and the number of strokes increased; and while the same valve and ports are made to serve both for admission and emission of steam, no further reduction in initial heat loss can be expected.

Given fairly dry steam, short ports, separate steam and exhaust valves, and lagging carefully attended to, the condensation caused by the action of the cylinder walls will be little, if any, more than is absolutely necessary for the best working conditions. It is with the ordinary valves and in the tortuous ports that the mischief is done before the steam reaches the cylinder, because during admission it is spread out



into a thin ribbon and the swirls and eddies set up thereby bring every particle of it into contact with surfaces whose mean temperature can only be slightly above that of the exhaust steam. On the other hand, when the cylinder is jacketed the metal surrounding the ports is heated by conduction from the cylinder walls, and if the heat given to cylinder walls could be concentrated at the ports it would be more economical.

To show what can be done with an engine properly designed to economize steam, Fig. 3 is the combined cards from a triple compound pumping engine, with separate steam and exhaust valves; piston speed, 200 ft. per minute; working pressure, 120 lbs.; cut-off at ·34 of the stroke. On comparing the steam lines up to cut-off point the beneficial effect of the separate valves is seen at once. In Fig. 1 the boiler pressure, when cards were taken, was 72 lbs., in Fig. 2 at 173 lbs., and in Fig. 3 at 120 lbs. In the first case there is a drop of 9½ lbs. between boiler pressure and cut-off. In the second, there is a drop of 10½ lbs., and in the third, full

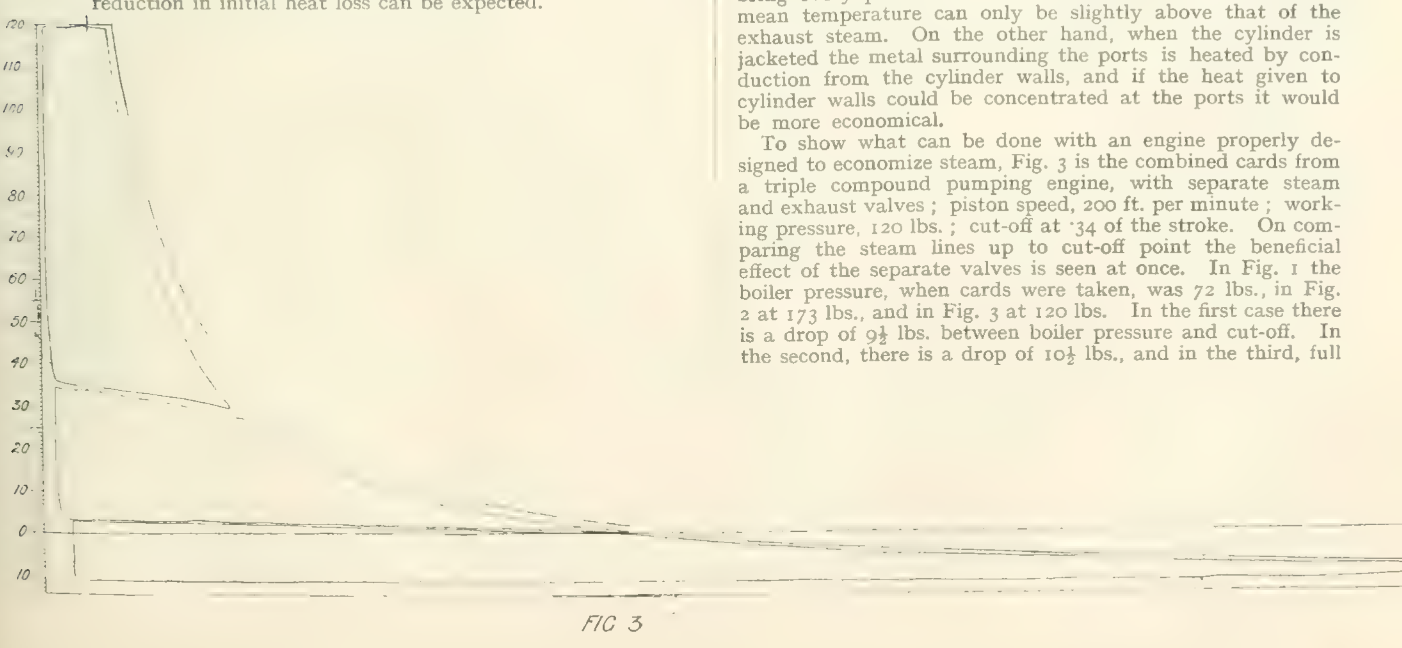


FIG 3

boiler press[illegible] maintained up to cut off, with dryness fraction [illegible] the full benefit of this is seen in the actual expansions in each case. Putting these figures in tabular form :—

	Curve 1.	Curve 2.	Curve 3.
[illegible] ins.	42 1/16, 73½	22½, 37, 60	28, 48, 74
[illegible], ins.	48	45	60
[illegible]t off per cent	[illegible]	52	34
Dryness fr. at cut-off	·75	·83	·88
Actual expansions	[illegible]	[illegible]	[illegible]
Piston speed ft per min	350	600	[illegible]
Pressure lbs per sq. in. ..	[illegible]	73	120
Steam, lbs. per I.H.P. per hour	17·01	14·25	9·26
	(Estimated)	(Estimated)	(Measured)
Jackets	–		All

There is no reason why the marine engine should not attain the same degree of excellence as is exhibited in curve 3, but certainly not so long as the slide valve is retained in its present form. The heat losses attributable to the slide valve will be dealt with later.

Referring to the increase of friction with high speeds, the engines in curve 1 have been running for over six years with the same set of piston rings, and they have every appearance of lasting another six or more years. The engines of curve 2 used two sets in H.P. and one set in M.P. cylinders in three years.

Another, and equally important, point from the shipowners' point of view, the slow running, coarse-pitched propeller of the old vessel is knots per hour better in bad weather than the fine-pitched high-speed propellers of the modern vessels on the same service.

In this connection, it would be interesting if some shipowner, having several vessels of the same size and type, had the hardihood to fit one of them with a coarse-pitched propeller and note the results for a year.

ELECTRICAL NOTES.

(From our Own Correspondent.)

Crane Equipment.

THE opportunity that cranes afford for the employment of electricity is almost self-evident. Instead of exposed steam leads and consequent loss by condensation and defective joints, we have cables, with which there are not the same disadvantages, and there is reason, therefore, for papers read on the subject at meetings of engineers. The latest of these has been at the North-East Coast Institution. The writer takes higher ground for the adoption of the type than we do, but that the motor only absorbs power when actually doing work and that in proportion to that work is the principal claim. The prime cost and cost of upkeep is however higher and has to be paid for. The author says speeds have been increased in recent years at the expense of larger motors and a diminished efficiency because the current is on for a short time, perhaps with the consequent increase for starting and waste in overheating the resistances. Hence, there is a loss of efficiency all round. The loads are very variable and to suit this condition the series motor is usually employed, on account of its wide range of torque and speed. The motor has to be totally enclosed for the purpose, and this tends to lower efficiency because there is not the same possibility of ventilation and the parts cannot be got at and defects observed. Armature shafts have to be designed more liberally than for ordinary motors, owing to the heavy torsional strains to which they are subjected by being continually reversed. The armature and commutator should be perfectly balanced or serious vibration will be set up and brush holders should be as simple as possible to prevent liability to work loose; indeed, the greatest care is required throughout the construction for the machine to withstand the exceptional strains of working. Brakes we have already mentioned in this column on account of their extreme importance. The controllers are also an important detail and one that often leads to great trouble by being put into the hands of an inexperienced operator. It will be seen, however, that the motor alone requires, for crane work, special care in construction, and is in its essential features quite different from one for ordinary work.

Faults in Dynamos and Motors.

Another writer essays in a paper he has read to give an epitome of the faults that may occur in a circuit, and obviously such a paper, covering such a wide range, is not a short one. We endeavour to extract a few leading points made. His method of describing short circuit, that bane of things electrical, is that owing to defective insulation parts of the circuit are cut out and hence no current flows that way. "Earth" defection is due to the insulation between the currents and a neutral part of the machine getting wrong. The consequent heavy idle currents that flow raise the temperature of the machine and cause further defects. He gives the commutator and its connections as where to look for the usual place of trouble, it being very rare to find a fault in the winding. Again, the circuit itself may offer too great a resistance to the flow of the current, limiting the amount flowing in the case of magnet windings. To show how to detect these faults is the aim of the writer. He calculates the resistance from known data of the machine and then measures by instrument, and any difference leads him to conclusions as to the faults. If the resistance so given is too high, he then says there are either bad connections in the circuit or the circuit has been incorrectly made. If too low, there are either short circuits or the circuit is defective again. He then goes on to show practically how he proceeds to test for the faults he diagnoses, but this is too long for us to follow him and too detailed for a column like this. His methods are familiar to most electricians.

Electric Capstans.

Capstans are not new in dock work, but until recent years, they were driven by hydraulic power. With, however, the larger introduction of electricity, this is an instance of the change-over. Not only trucks are hauled by these means, but also ships. For a small job of truck hauling of about a ton, the capstan is built in a watertight iron casing, the top plate being flush with the ground. The capstan head is driven by the motor through a single reduction worm gearing, the end thrust of the worm being taken on ball bearings. The controller, of the tramway type, is operated by a foot pedal, arranged that the top of pedal can be dropped flush with the top plate of capstan when not in use and an automatic brake is applied directly the operator removes his foot from the pedal and this immediately stops the capstan. The motor is of the compound wound direct current type and gives out 20 h.p. at 420 volts. Further particulars may be obtained from Messrs. Adamson, Ramsbottom & Co., Ltd., Birkenhead, who are the makers. The machine appears to us to be worthy of attention and is of sound mechanical design.

Radio Telegraphic Station.

The Post Office has to some extent sprung upon the public the fact that they have erected a wireless station of their own on the English Channel coast. The situation selected is Bolt Head, on the extreme southern point of Devonshire. From this position it will be possible to communicate with all ships fitted for the purpose, whatever their system or country of origin. This is the outcome of the Convention held in Berlin, the provisions of which came into operation on July 1st last. The station has been erected by the Marconi Co. in competition with other makers in the same line, and the latest improvements are said to be embodied in this, a model of its kind. The range is given as 250 miles. The other eight stations worked by the Marconi Co. around the coast operate under the same conditions as their Government one, and can communicate with ships fitted up on any other system. The Postmaster-General went down to inaugurate the new station.

MR. PETER SAMSON, who has served as the engineering chief of the Consultative Department of the Board of Trade for many years, is about to retire from the appointment and active service, accompanied by the hearty good wishes of the many engineers who have been associated with him in their ordinary spheres of duty. Our meetings with Mr. Samson have left pleasant recollections in our memory and we join in desiring that he may enjoy many years of healthful retirement. It was with pleasure we heard of the appointment of Mr. Alex. Boyle to the vacant position, and we offer our congratulations, being assured that the change from Mark Lane to the office of the Consultative Department will meet with universal satisfaction in the promotion it indicates for the chief examiner, who has merited it by the work he has done since he entered that position.

FORBES' PUMP.

THE adjoining illustrations in Figs. 1 and 2 show a new type of pump, which has recently been put on the market by Messrs. Davie & Horne, of Johnstone, N.B., and is the invention of Mr. H. Forbes, chief engineer in one of the Union Castle Line steamers, Southampton.

This pump is somewhat similar in general design to some of the other pumps on the market, with the exception of one important feature, which is the simplicity of valve gear. This arrangement, which is illustrated in Fig. 2, does away with the shutter valves or other intricate arrangement used for controlling the steam to the pump, and has the ordinary element of the piston valve with its gear for working mechanically outside. Any engineer who has had

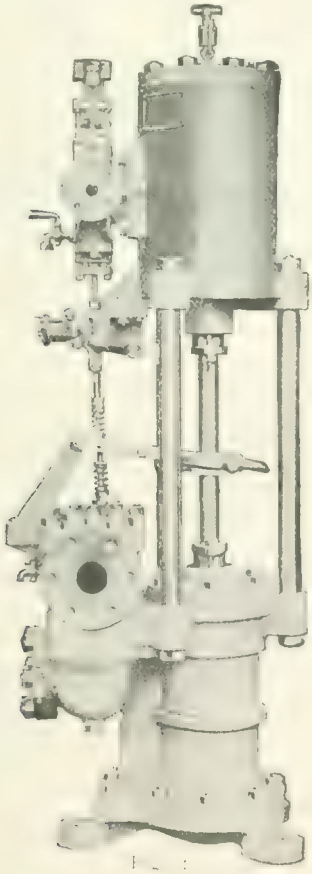


Fig. 1.

the trouble of bedding the steam valves of some of the pumps on the market will readily see the advantage of an arrangement to reduce this trouble. The valve arrangement is so worked that it is possible for the pump to stop in any position, while the valve can only remain at either one end or the other of the stroke. It also reduces the clearances to the lowest possible amount, and for steam consumption we understand it compares very favourably with any other pump.

Referring to Fig. 2, it will be seen that the valve spindle H has coupled to it an operating rod G, carrying two sets of locknuts and two springs JJ, between which is disposed a pivoted collar carried by the oscillating lever C operated by the crosshead B. The enlarged portion of the valve spindle has a recess X, into which engages one of the spring-pressed bolts P, the releasing of which is effected by the crosshead through a system of levers from the drawbar S, having adjusting nuts.

The operation of the gear is as follows: Assume for example, that the valve is locked by the upper bolt P in position for the port X to be full open to steam. The main piston begins its stroke, the crosshead moving the lever C compresses the lower spring J. As the piston nears the end of its stroke and arrives at the point of cut-off, the crosshead engages the lower nuts on the drawbar S and withdraws the bolt P from the recess. The compressed spring now released moves the valve to the opposite end of its stroke, where it is again automatically held in position by the lower bolt P until the corresponding point of cut-off on the return stroke.

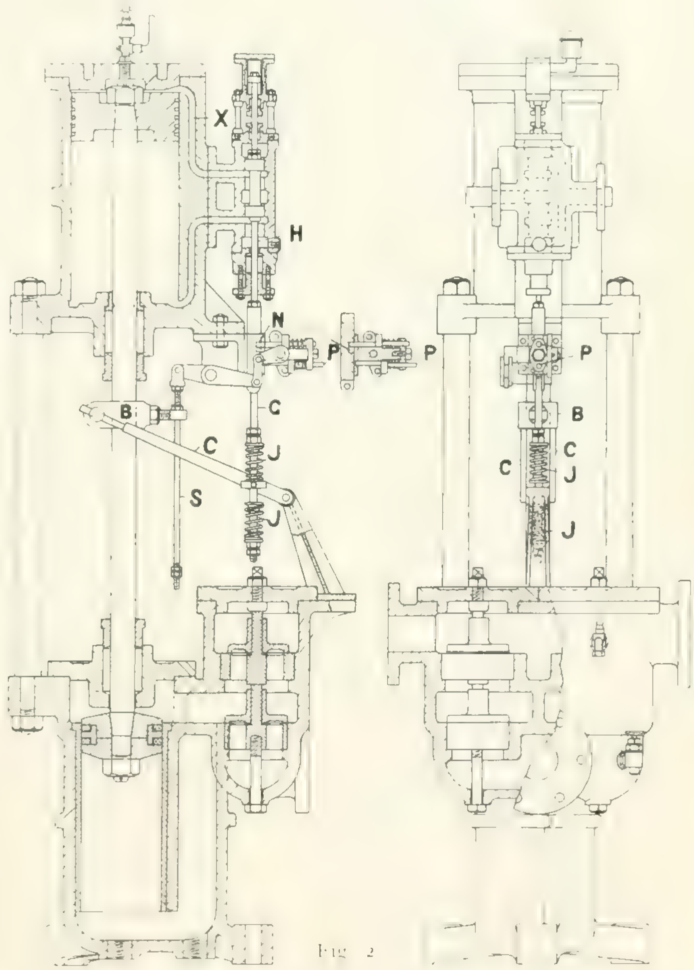


Fig. 2.

Thus the pump will continue to work its own valve in a direct manner so long as it is supplied with steam.

The point of cut-off and the necessary spring pressure for moving the valve can be adjusted by varying the position of the regulating nuts on the drawbar S and rod G respectively, a set of conditions to suit particular circumstances which can be readily arranged for by the engineer in charge after a trial with available pressure of steam and for the speed desired.

The pump will start from any position and its external valve control is always under the eye of the attendant. The steam piston clearance can be reduced to 1/16 inch, and small ports can be used, with consequent saving in steam consumption and the wear and tear to the mechanism is reduced to a minimum.

Summary of Shipbuilding Returns of United Kingdom in 1908, arranged in order of Tonnage built by each Firm.

	Name of Firm.	Place.	No. of Ships.	Total Tons.†
1	Harland & Wolff, Ltd.	Belfast	[illegible]	106,528
2	Swan, Hunter & Wigham-Richardson, Ltd.	Tyne	1[illegible]	61,[illegible]
3	Sir W. G. Armstrong, Whitworth & Co., Ltd.	Tyne	[illegible]	[illegible]1,[illegible]4
4	Workman, Clark & Co., Ltd.	Belfast	[illegible]	50,303
5	Russell & Co.	Clyde	1[illegible]	48,618
6	Barclay, Curle & Co., Ltd.	Clyde	6	38,810
7	Chas. Connell & Co., Ltd.	Clyde	7	30,698
8	Sir Raylton Dixon & Co., Ltd.	Tees		26,146
9	Northumberland Shipbuilding Co., Ltd.	Tyne	6	22,840
10	Wm. Denny & Bros.	Clyde	[illegible]	20,[illegible]7
11	Wm. Doxford & Sons, Ltd.	Wear		20,271
12	A. Stephen & Sons, Ltd.	Clyde	4	19,964
13	Cammell, Laird & Co., Ltd.	Mersey	6	19,142
14	D. and W. Henderson & Co., Ltd.	Clyde	6	17,805
15	Fairfield Shipbuilding Co., Ltd.	Clyde	[illegible]	17,[illegible]2[illegible]
16	Wm. Dobson & Co.	Tyne	8	17,164
17	Caird & Co., Ltd.	Clyde	2	16,723
18	Napier & Miller, Ltd.	Clyde	4	16,211
19	John Brown & Co., Ltd.	Clyde	3	15,[illegible]
20	Irvine's Shipbuilding & Dry Docks Co. Ltd.	Hartlepool	6	14,200
21	R. Craggs & Sons, Ltd.	Tees	3	12,870
22	Hawthorn, Leslie & Co., Ltd.	Tyne	4	12,810
23	Vickers, Sons & Maxim, Ltd.	Barrow		12,487
24	Wm. Beardmore & Co., Ltd.	Clyde	1	11,533
25	Wm. Hamilton & Co., Ltd.	Clyde	2	11,386
26	Grangemouth & Greenock Dockyard Co.	Clyde	12	11,162
27	Caledon Ship. & Engineering Co., Ltd.	Tay	4	10,681
28	J. L. Thompson & Sons, Ltd.	Wear	[illegible]	10,[illegible]21
29	Tyne Iron Shipbuilding Co., Ltd.	Tyne	3	10,512
30	J. Readhead & Sons	Tyne	2	10,123
31	Short Bros., Ltd.	Wear	6	10,054
32	Sir James Laing & Sons, Ltd.	Wear	2	9,754
33	A. MacMillan & Son, Ltd.	Clyde		9,71[illegible]
34	C. H. Walker & Co., Ltd.	Bristol C.	59	8,424
35	Simons & Co., Ltd.	Clyde	31	7,933
36	Gourlay Bros. (Dundee), Ltd.	Tay	[illegible]	7,[illegible]
37	Clyde Shipbuilding & Engineering Co., Ltd.	Clyde	4	7,2[illegible]1
38	Palmer's Shipbuilding & Iron Co.	Tyne	3	7,149
39	Blyth Shipbuilding Co.	Blyth	3	6,725
40	Lobnitz & Co.	Clyde	23	6,665
41	J. Blumer & Co.	Wear	2	6,309
42	Smith's Dock Co., Ltd.	N. Shields	31	6,151
43	Earle's Shipbuilding & Engineering Co., Ltd.	Humber	9	6,130
44	Craig, Taylor & Co., Ltd.	Tees	2	6,010
45	Ailsa Shipbuilding	Clyde	22	5,985
46	R. Stephenson & Co., Ltd.	Tyne	2	5,940
47	Osbourne, Graham & Co.	Wear	3	5,317
48	Robert Thompson & Sons, Ltd.	Wear		5,301
49	Ropner & Sons, Ltd.	Tees	2	5,005
50	Wood, Skinner & Co., Ltd.	Tyne	8	4,832
51	Dundee Shipbuilding Co., Ltd.	Tay	11	4,776
52	Cochrane & Sons	Humber	24	4,437
53	Scott's Shipbuilding & Engineering Co., Ltd.	Clyde	2	4,171
54	Bartram & Sons	Wear	1	[illegible],738
55	Wm. Harkess & Sons	Tees	4	3,731
56	J. Priestman & Co.	Wear	2	3,679
57	Scott of Kinghorn, Ltd.	Forth	3	[illegible]14
58	A. G. Rennie	Thames	1[illegible]	3,483
59	Sunderland Shipbuilding Co., Ltd.	Wear	[illegible]	3,296
60	Goole Shipbuilding & Repairing Co., Ltd.	Goole	17	3,286
61	Ferguson Bros.	Clyde	9	3,086
62	Wm. Pickersgill & Sons	Wear	2	2,968
63	Ailsa & McLellan	Clyde	2[illegible]	2,930
64	Cook, Welton & Gemmell, Ltd.	Humber	12	2,760
65	John Crown & Sons, Ltd.	Wear	4	2,640
66	Bow, McLachlan & Co., Ltd.	Clyde	24	2,372
67	Hall, Russell & Co.	Aberdeen	11	2,310
68	David J. Dunlop & Co.	Clyde	1	2,300
69	Mackie & Thomson	Clyde	17	2,157
70	Ramage & Ferguson, Ltd.	Forth	2	2,046
71	A. Rodger & Co.	Clyde	2	1,890
72	J. Fullerton & Co.	Clyde	[illegible]	1,883
73	S. P. Austin & Son, Ltd.	Wear	2	1,728
74	Scott & Sons	Clyde	11	1,629
75	Dublin Dockyard Co.	Dublin	4	1,574
76	John Chambers	Thames	20	1,302
77	Thos. Dobson & Co.	Humber	7	1,316
78	Joseph T. Eltringham & Co.	Tyne	6	1,184
79	Henry Scarr	Humber	8	1,055
80	Murdock & Murray	Clyde	1	282

*1	Wm. Gray & Co., Ltd.	Hartlepool	7	27,188
*	Richardson, Duck & Co.	Tees	[illegible]	8,027
*	A. & J. Inglis, Ltd.	Clyde		6,777
*4	Fleming & Ferguson	Clyde	10	5,050
*	Montrose Shipbuilding Co.	Tay	11	2,957
*	Ardrossan Dry Dock & Shipbuilding Co.	Clyde	14	1,[illegible]17

† Board of Trade gross tons register.
* Board of Trade gross tons register, including erections.

List of Vessels Launched in 1908.

ENGLISH.

THE TYNE.

Sir W. G. Armstrong, Whitworth & Co., Ltd.

	Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
	Minas Geraes	Steel	Foreign	19,280	—	23,500
	Carpathian	,,	British	4,900	—	2,000
	Roumanian	,,	,,	4,900	—	2,600
	Joyo Maru	,,	,,	5,1[illegible]5	—	2,700
	Hyrcania	,,	,,	5,228	—	2,880
	El Lobo	,,	,,	4,500	–	2,700
	Rosario	,,	Foreign	1,055	—	1,650
	Parana	,,	,,	1,055	—	1,650
	Luegen	,,	British	5,025	—	2,610

Blyth Shipbuilding and Dry Docks Co., Ltd., Blyth.

	Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
†	Sir Walter Scott	Steel	British	1,405	—	1,080
†	Harvey Scott	,,	,,	1,400	—	1,080
†	Werribee	,,	Colonial	3,800	—	1,750

Joseph T. Eltringham & Co., South Shields.

	Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
	No. 26[illegible] (Tug)	—	—	104	—	475
	,, 266 ,,	—	—	35	—	140
	,, 267 ,,	—	—	119	—	475
	,, 268 (Trawler)	—	–	470	—	750
	,, 26[illegible] (Tug)	–	–	100	—	650
	,, 270 (Trawler)	–	–	206	—	450

R. & W. Hawthorn, Leslie & Co., Ltd., Hebburn-on-Tyne.

	Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
t	Torpedo Boat No. 22	—	British	280dis	280	4,000
	Indianic	—	Foreign	4,260	5,445	3,000
	Nippon	—	,,	4,010	5,100	2,800
	Hellenic	—	,,	4,260	5,445	3,000

Hepple & Co., Ltd., South Shields.

	Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
*	Bergamo	—	Foreign	59	2[illegible]	100
†	Elizabeth (Cutter)		,,	34	77	350
	Nos. 223, 224, 225 and 226 (Barges)	—	,,	–	60ea	—
*	Glenrose (Ketch)	—	British	109	286	360
	Nos. 23[illegible] and 240 (Barges)		Foreign	–	120ea	—

W. P. Huntley, Hebburn-on-Tyne.

	Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
	Henry Guy .. (Sailing)	—	British	40	–	—
	Crescent Brand (Screw)		,,	50	–	—

The Northumberland Shipbuilding Co., Ltd., Howdon-on-Tyne.

	Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
	Fernandina	—	British	2,088	—	1,100
	Cundall	—	,,	2,083	–	1,100
	Hidalgo	—	,,	4,740	—	2,000
	No. 156	–	—	6,280	—	3,200
	Mina	–	Foreign	3,000	—	1,440
	Patris	—	,,	4,650	—	4,650

Palmer Shipbuilding and Iron Co., Ltd., Jarrow-on-Tyne.

	Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
	No. 787 Destroyer	Steel	British	450	450	7,200
	Hesperus	,,	Foreign	6,35[illegible]	7,268	3,000
	No. 24 Torpedo Boat	,,	British	310	310	4,000
	Engines only	–	—	—	—	1,900

John Readhead & Sons, West Docks, South Shields.

	Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
	Sargasso	–	British	4,608	—	2,500
	Harford	—	,,	5,515	—	2,500

J. P. Rennoldson & Sons, South Shields.

	Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
†	Makis	Steel	Foreign	122	—	300
*	Power	,,	British	148	—	1,050
*	Salvor	,,	,,	200	—	425
*	Clwyd	,,	,,	274	—	350
†	Wandle (Engined only)		,,	–	–	970

Smith's Dock Co., Ltd., North Shields.

	Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
	No. 370	Steel	–	256	—	500
	Nos. 371 and 372	,,	—	257ea	—	500ea
	Nos. 37[illegible] and 376	,,	—	67ea	—	200ea
	4 Vessels	,,	—	87ea	—	240ea
	1 ,,	,,	—	58	—	200
	2 ,,	,,	—	260ea	—	500ea
	1 ,,	,,	—	222	—	400
	4 ,,	,,	—	22ea	—	420ea
	1 ,,	,,	—	245	—	470
	2 ,,	,,	—	245ea	—	405ea
	1 ,,	,,	—	228	—	450
	2 ,,	,,	—	203ea	—	360ea
	1 ,,	,,	—	246	—	470
	3 ,,	,,	—	198ea	—	390ea
	1 ,,	,,	—	216	—	430
	1 ,,	,,	—	247	—	500
	1 ,,	,,	—	248	—	500
	1 ,,	,,	—	224	—	450

Robert Stephenson & Co., Ltd., Hebburn-on-Tyne.

	Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
†	Gladys (Steam)	Steel	British	3,028	—	1,400
†	Beaverton ,,	,,	,,	2,011	—	930

Tyne Iron Shipbuilding Co., Ltd., Willington Quay-on-Tyne.

	Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
†	Petroleine	Steel	British	4,205	4,463	2,500
†	Clearfield	,,	,,	4,207	4,464	2,500
†	Princesse Clementine	,,	Foreign	2,100	2,924	1,660

t Turbine. * Compound. † Triple.

Swan, Hunter & Wigham Richardson, Ltd., Wallsend and Walker-on-Tyne.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
Mergauser ..	—	[illegible]	[illegible]	-	[illegible]
Langturm	[illegible]	Foreign	[illegible],744	-	2,500
J. A. McKee	[illegible]	British	2,2[illegible]	-	[illegible]
L'Aude	—	Foreign	2,[illegible]0[illegible]	[illegible]	[illegible]
Cacique	[illegible]	[illegible]	[illegible]	[illegible]	1,700
Hermion	[illegible]	British	[illegible]	[illegible]	2,600
City of Naples	[illegible]	,	[illegible]	[illegible]	3,200
Engineer ..	[illegible]	,	[illegible]	[illegible]	[illegible]
Callao Floating Dock	[illegible]	[illegible]	[illegible]	-	-
Trinculo	—	British	[illegible]	-	2,600
Mount Stephen	—	,	[illegible]	—	1,200
Cheyenne	—	,,	[illegible]	[illegible]	2,700
Lagos Floating Dock ..	[illegible]	Colonial	[illegible]	[illegible]	[illegible]
Conch	[illegible]	British	[illegible],720	[illegible]	[illegible]
Fraserburgh Floating Dock	—	,	[illegible]	[illegible]	—
Alfonso Penna, Floating Dock for Para	[illegible]	Foreign	1,57[illegible]	[illegible]	[illegible]
Lauro Mueller, Floating Dock for Para	—	,,	1,570	—	—

Wood, Skinner & Co., Ltd., Bill Quay, Newcastle-on-Tyne.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
† Deux Frères	Steel	Foreign	437		580
† Stamboul ..	,,	,,	2,595		1,6[illegible]0
† San Miguel ..	,,	,	1,740		1,570
5 English Admiralty Horse Boats	,,	British	6[illegible]	–	–

Wm. Dobson & Co., Newcastle-on-Tyne.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
Ocean ..	Steel	Foreign	[illegible]	[illegible]	2,[illegible]
Falk ..	,	,,	[illegible]	-	1,1[illegible]
Kildin .	,,	,,	1,[illegible]1	-	1,080
Cerima .	,	,,	1,[illegible]2	—	1,050
Wandle	,,	British	[illegible]	—	[illegible]70
Spen ..	,,	,,	1,[illegible]2	—	[illegible]
Roi Leopold	,,	Foreign	2,[illegible]7	—	1,660
Cabo Carvoeiro	,,	,,	2,[illegible]	—	1,150

WEAR.

S. P. Austin & Son, Ltd., Sunderland.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
† Corbet Woodall ..	Steel	British	917	—	7[illegible]
† Lady Londonderry	,,	,,	[illegible]	—	830

Bartram & Sons, South Dock, Sunderland.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
Coniston Water	Steel	British	[illegible]		1,840

John Blumer & Co., North Dock, Sunderland.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
Esneth ..	Steel	British	[illegible],247	3,02[illegible]	1,890
Galatee	,,	Foreign	[illegible],002	3,4[illegible]3	1,680

John Crown & Sons, Ltd., Strand Slipway, Sunderland.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
† Dacapo	Steel	Foreign	720	—	[illegible]
† Clara ..	,,	,,	[illegible]41	—	[illegible]
† Hampshire	,,	British	[illegible]	—	77[illegible]
* Repertor	,,	,,	240		300

William Doxford & Sons, Ltd., Sunderland.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
† Lotusmere ..	—	British	[illegible]		1,450
† Penrose ..	—	,,	[illegible]	-	1,4[illegible]0
† Haigh Hall ..	—	,,	4,[illegible]		1,[illegible]0
† Grindon Hall	—	,,	[illegible]		1,[illegible]
† Yeddo ..	—	Foreign	[illegible]0	-	2,700

Sir James Laing & Sons, Ltd., Sunderland.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
† Servian	Steel	British	4,99[illegible]	[illegible],17[illegible]	2,648
† Lutetian	,,	,,	4,757	4,[illegible]1	2,12[illegible]

Osbourne, Graham & Co., Hylton, Sunderland.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
† Antares ..	Steel	Foreign	1,841	2,084	1,2[illegible]
† Belle Ile	,,	,,	1,[illegible]4	2,1[illegible]	1,20[illegible]
† Papelera	,,	,,	1,[illegible]2	1,[illegible]	1,000

Wm. Pickersgill & Sons, Ltd., Sunderland.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
s.s. Mervyn ..	—	British	2,118		..
s.s. Ezardian	—	,,	[illegible]		..

J. Priestman & Co., Southwick, Sunderland.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
† Burmah	Steel	Colonial	2,272	2,44[illegible]	2,000
† Greenbatt	,,	British	1,404	1,4[illegible]0	1,080

Short Brothers, Ltd., Sunderland.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
Styliani Bebis ..	—	Foreign	3,603	4,692	1,500
Ganda ..	—	,,	1,[illegible]	2,[illegible]	1,1[illegible]
Flandria	—	,,	1,[illegible]	2,34[illegible]	1,1[illegible]
Skerne ..	—		[illegible]	[illegible]	880
No. 347	—		[illegible]	[illegible]	[illegible]
No. 348 ..	—	—	824	824	800

Sunderland Shipbuilding Co., Ltd., Sunderland.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
Oxotekb	Steel	Foreign	71[illegible]	-	520
Odland	,,	,,	1,249	—	[illegible]
Milos ..	,,	,,	1,3[illegible]	—	870

Joseph L. Thompson & Sons Ltd., Sunderland.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
Bedouin	—	British	4,73[illegible]	5,34[illegible]	2,600
Henry R. James	—	,,	*3,206	3,5[illegible]7	1,[illegible]
Norden	—	Foreign	*2,[illegible]	[illegible],617	1,[illegible]10

* Approximate.

Robt. Thompson & Sons, Ltd., Southwick Yard, Sunderland.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
† Kamfjord	Steel	Foreign	634	799	500
* Copsewood ..	,,	British	[illegible]	[illegible]	480
† Einstad ..	,,	Foreign	692	712	[illegible]0
† Navarra	,,	,,	1,0[illegible]	1,722	920
† Cataluña	,,	,,	1,0[illegible]	1,722	920

* Compound. † Triple.

TEES AND HARTLEPOOL.

R. Craggs & Sons, Ltd., Tees Dockyard, Middlesbrough.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
Brika ..	[illegible]	British	3,975		1,[illegible]
Paul Paix	[illegible]	,	4,[illegible]		2,250
Gascony	[illegible]	[illegible]	4,[illegible]		[illegible]

Craig, Taylor & Co., Ltd., Stockton-on-Tees.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
Oratios Couppas	[illegible]	[illegible]	[illegible]7	[illegible]	[illegible]
† Norburn	-	British	2,[illegible]	[illegible]	[illegible]

Sir Raylton Dixon & Co., Ltd., Middlesbrough-on-Tees.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
Athinai (Steam) ..	Steel	Foreign	6,742	7,1[illegible]	[illegible]
Konakry ,,	,,	British	4,406	5,720	[illegible]
Queensgarth. ,,	,	,,	[illegible]	2,12[illegible]	[illegible]
Vasari ,,	,	,	8,500	9,900	[illegible]
Fiona .. ,,	,,	,,	4,400	[illegible]	[illegible]

Wm. Harkess & Sons, Middlesbrough.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
† Bar	Steel	British	[illegible]7		[illegible]
† Bida	,,	,,	[illegible]	-	[illegible]
† Dorset Coast	,,	,,	672		600
† Jamaica	,,	,,	1,1[illegible]		1,010

Richardson, Duck & Co., Stockton-on-Tees.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
Fernhill (Steamer)		British		2,[illegible]	1,7[illegible]
Cressington Court ,,		,,		4,852	2,150
6 Lighters (Sail)	-	Foreign	-	614	
1 Pontoon shipped abroad in pieces				[illegible]	

Ropner & Sons, Ltd., Stockton-on-Tees.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
† Hopper Barge ..	Steel	British	707		[illegible]0
† Leeds City	,,	,,	4,2[illegible]		2,200

W. Gray & Co., Ltd., West Hartlepool.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
Saranac		British	—	[illegible]24	2,4[illegible]
Familiaris		Foreign		[illegible]1[illegible]	1,400
Jervaulx Abbey ..	-	British		1,342	[illegible]
Stigstad	-	Foreign		4,920	2,500
Kapunda	-	British		3,619	[illegible]
Harfleur	-	,,		5,107	2,000
Ocean Queen	-	Foreign	- -	[illegible]	2,000

Irvine's Shipbuilding & Dry Docks Co., Ltd., West Hartlepool.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
Frankenwald	—	Foreign	4,500	-	2,7[illegible]
Grovehill	—	,,	2,050		1,000
Charleston	-	British	2,050		1,000
Portinglis		,,	2,050		1,000
Arthur ..		Foreign	1,500		850
Rouen ..	-	British	2,0[illegible]		1,[illegible]

HUMBER.

Cochrane & Sons, Selby.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
2 Trawlers	Steel	Foreign	3[illegible]ea	—	6[illegible]0ea
No. 426	,,	British	2[illegible]6	—	450
Onward	,,	,,	266	—	630
Xerxes	,,	,,	242	—	500
2 Drifters	,,	,	[illegible]3ea	-	1[illegible]0ea
Vive and No. 446	,,	,,	270ea	—	550ea
Premier and Varonil ..	,	,,	2[illegible]ea	—	4[illegible]0ea
Delta B.	,,	Foreign	219	—	420
8 Lighters	,,	,,	96 lbs. ea		—
Consort	,,	British	130	—	460
Esperanto	,,	,,	217	—	250
Rose of England ..	,,	,,	225	—	450
No. 41[illegible]	,,	,,	100	—	[illegible]0

Cook, Welton & Gemmell, Ltd., Beverley.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
* Kinsman	Steel	British	11[illegible]	—	460
† Orizaba ..	,,	,,	2[illegible]	—	4[illegible]0
† Revello and Reporto ..	,,	,,	230ea	—	450ea
† Median ..	,,	,,	214	—	450
† Alfred-Edith	,,	Foreign	261	—	450
† Trygon ..	,,	British	2[illegible]	—	501
† 5 Fleeters	,,	,,	15[illegible]ea	-	262ea
† Macfarlane	,,	,,	2[illegible]4	-	[illegible]70
† St. Ives	..	,,	33[illegible]	—	[illegible]70

Thos. Dobson & Co., Hessle-Haven.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
* Lunesdale (Screw Schooner Rig) ..	Steel	British	236	—	382
6 Lighters	,,	,,	1,0[illegible]	—	—

Earle's S. and E. Co., Ltd., Hull.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
Kirkham Abbey ..	—	British	1,162	—	3,000
New Crown	-	,,	25[illegible]	—	500
4 Vessels (Hulls only)	—	,,	262ea	—	—
Pilot	—	,,	20	—	100
Kilnsea	—	,,	[illegible]	—	1,600
Lightship (Hull only)	—	,,	[illegible]7	—	—

Goole Shipbuilding and Repairing Co., Ltd., Goole.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
[illegible] Vessels	—	British	1[illegible]ea	—	300ea
Ardent and Arton	-	,,	22[illegible]ea	—	400ea
Tay I.	-	,,	[illegible]27	—	450
6 Vessels	—	,,	64ea	—	—
Ibis V.	-	Foreign	2[illegible]	—	400
Ospray II. ..	—	British	278	—	400
River Dart	—	,,	[illegible]	—	520
Delta A		Foreign	2[illegible]	—	400
Josephine I. ..	—	British	[illegible]	—	500

* Compound. † Triple.

Henry Scarr, Hessle, Hull.

Name of Vessel.	Built of	Owners	G.T. Regis.	G.T. inclu. erect.	I.H.P.
[illegible]	Steel	British	100ea	—	
* [illegible]	..	—	10ea	—	200ea
[illegible]	..	—	57		—
[illegible] Water Boat	..	—	[illegible]		20
[illegible] Steam, Sail Keel	..	..	140		
[illegible]	..	..	220		

J. Scarr & Son, Beverley and Howden, Yorks.

Name of Vessel.	Built of	Owners	G.T. Regis.	G.T. inclu. erect.	I.H.P.
John and Ann	Steel	British	56		
The Marshalls	..		[illegible]		
Damon and Annie [illegible]	..	..	[illegible]ea		
Trusty and Hope	..	..	140ea		

Howden Yard.

Name of Vessel.	Built of	Owners	G.T. Regis.	G.T. inclu. erect.	I.H.P.
The Derwent No. II	Steel	British		60	
4 Vessels	..	..	[illegible]ea		

W. H. Warren. New Holland.

Name of Vessel.	Built of	Owners	G.T. Regis.	G.T. inclu. erect.	I.H.P.
* La Mouette (Trawler)		Foreign	[illegible]		260
* Gazelle and Elsa Partiss (Tugs)		British	[illegible]ea		200ea
Lucy (Sail)		..	140		

THAMES, &c.

Beaching Bros., Ltd., Great Yarmouth.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
* Lerwick and Girl Rhoda, Ketches ..	Wood	British	80ea		[illegible]ea
* [illegible] Ketch	..		72		120
Gladys and Rose	..		92		130
* Bono	..	..	7		1[illegible]

Geo. Brown & Co., Garvel Shipyard, Greenwich.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
* Ludovico, Twin-Screw	Steel	Foreign	655		650
* Ardnagrena, Screw	..	British	225		[illegible]
* Mercedes III	..	..	18		400

John Chambers, North Side Harbour, Lowestoft.

Name of Vessel.		Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
Spynie Castle	Steam	Wood	British	82		200
* Ugie	..	..	..	5[illegible]		200
* Phillis Annie	..			88		200
* 3 Drifters			..	85ea		200ea
* Iva				8[illegible]		200
* Glen Corran				8[illegible]		200
* Young Archie	..			[illegible]		1[illegible]0
* Good Friend	..	..	..	57		225
* Girl's Friend	..	..		[illegible]		130
Splendour	Sail	,,	,,	54	—	
Marcus	..		..	57		
Coriander	..			55		
* Young Roland	Steam			[illegible]		1[illegible]0
* Golden Spur	..			[illegible]		1[illegible]0
No. [illegible]25, Coal Barge		..		20		
White City	Sail	,,	,,	58	—	—
* Searcher	Steam	..	..	55		130
Golden Oriole	Sail	..	..	[illegible]		

Crabtree & Co., Great Yarmouth.

Name of Vessel.		Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
4 Drifters	Steam	Steel	British	84ea		[illegible]

Edwards & Co., Ltd., Millwall, E.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
* David	Steel		271		47
* [illegible] 84	..		159		260
* San Giorgio			[illegible]1		240
[illegible] Pontoon			2		
[illegible]87 ..	..		46		
* Etoile D'Orient			22		12
[illegible] and [illegible] (Lighters)	..		19ea		
* [illegible] 91			11		4
* Watchful			20		75
* [illegible]			1[illegible]		400
[illegible] and [illegible] Lighters			[illegible]ea		
[illegible] Pontoon			[illegible]		
[illegible]			45		

Fellows & Co., Ltd., Yarmouth.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
‡‡ Panope	Wood		77		
‡‡ [illegible]	..		78		
‡‡ Girl Ena			[illegible]		
‡‡ Mary [illegible]			76		
‡‡ [illegible]			[illegible]		

Forrestt & Co., Ltd., Wyvenhoe.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
* No. [illegible] Pinnaces	Wood	—	[illegible]		[illegible]
* Admt. Tug	Steel		[illegible]		[illegible]
* [illegible] Tug			100		[illegible]00
* 4 Launches	Wood		[illegible]ea		120ea
No. 604 Camel	Steel		1		
* No. 605 & 606 Launches	..		76		20
* Teixeira Soares Tug			[illegible]		400
* [illegible]			206		[illegible]
No. 609 & 610 Lighters	[illegible]		122		
No. 611 & 612 Punts	Wood		[illegible]		
No. [illegible] Camel	Steel		[illegible]		15

Gill & Sons, Bridge Yard, Rochester.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
m [illegible] Launches	Teak	British	—	—	[illegible] B.H.P.
m Florence Castalia	,,	,,	—	—	10 ,,
[illegible] Barge	Pine				
[illegible]	Mahog.	—			[illegible]
[illegible] Ketch			1		
[illegible] Cutter Gig		Admiralty			

* Compound. † Triple. ‡ High Pressure. ‡‡ Compound Surface Condensing.
a Quadruple. m Motor.

G. Rennie & Co., Thames Street, Greenwich.

Name of Vessel	Built of	Owners	G.T. Regis.	G.T. inclu. erect.	I.H.P.
4 Lighters			245each		
2 Hopper Barges			250ea ..		
No. 1080, Tunnel Launch			15		55
No 1081 Motor Launch ..			20 ..		65
Egbom, Stern Wheeler			130 ..		450
2 Lighters ..			140ea		
No. 1085, Lighter			[illegible]50		
[illegible], Sailing Vessel			106		
No. 1087, Dredger			416		190
Camel No. 1, Salvage Vessel			700 ..		

A. W. Robertson & Co., Canning Town, E.

Name of Vessel	Built of	Owners	G.T. Regis.	G.T. inclu. erect.	I.H.P.
8 Lighters ..	Steel		960		
1 Screw Tug	..		40		90

ENGLISH CHANNEL.

Camper & Nicholson, Ltd., Gosport, Hants.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
m Pampa (Schooner Yacht) ..	Composite	—	—	130	60
m Stove (Yawl Yacht)	Wood			40	6[illegible]
* Ferry Queen (Ferry Steamer)	Steel	British	—	55	90

John Thomas Crampton, Albion Shipyard, Portsmouth.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
Finch	Wood		320		
Kaiser ..	..		120		
3 [illegible] Steam Pinnaces, Screw			60		
26 Floating Stages	Wood	—	200	—	—
7 Sailing Launches			80		

R. Cock & Sons, Quay, Appledore, R.S.O., Devon.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
W. M. L. (3-mast Schooner)	Steel	British	144		
Kipper (Fore & Aft Schooner)	..	..	99		

Day, Summers & Co., Ltd., Southampton.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
† Sagitta (Steam)	Steel	Foreign	742 approx.		1,600
* Emily ..	..	..	87		350
* No. 143 Tug	..		87		350

J. & W. B. Harvey, Littlehampton.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
Boaz (Ketch)		British	93		

J. G. Fay & Co., Southampton.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
Hervina (Cutter)	Wood	British	7	—	—
Mignonette	,,	,,	7		

Hartley Mead, East Cowes.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
m Ombah	Wood	British		16	17B.H.P.
The Jess	..	—		10	—
2 34 Ad. Cutters	..			16ea	

Philip & Son, Ltd., Dartmouth.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
* T. J. Cooke ..	Wood	British	30		80
* Penguin	..		25		70
* Venture	Steel	British	55		150
* Horse Ferry Boat	Wood		15		—
* 2 60ft. Admiralty Launches	Steel	..	45ea		140ea
* Santa Ana	Wood	Foreign	40		85
m Etheldreda	Steel	British	70		180
* Malacca	..	..	140		500
Several small boats, totalling			40		200
* Tug	Wood	British	30		100

Simpson, Strickland & Co., Ltd., Dartmouth, Devon.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
a No. 698	Wood		2		14
a No. 699	..		[illegible]		19
No. 702	Steel		20		
* No. 2	..	Foreign	[illegible]		150
‡ Dabbur	..	..	[illegible]		25
‡‡ Namla	..	..	[illegible]		25
‡‡ 3 Vessels	..		4ea		40ea
a No. 700	Wood		2		18
‡‡ No. 704	..				23
No. 705	..	Foreign			34
‡‡ No. 712	..		[illegible]		23
† Mercedes II.	Steel	Foreign	125	—	1,900
Medina	Wood		2		—
a No. 7[illegible]	Wood		4		140
‡‡ La Paz	..	Foreign	6		40
No. 715	..	..	2		18
Machinery only supplied					493

Geo. & Thos. Smith, Ltd., Rock Channel, Rye, Sussex.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
4 Trawlers (Ketch) ..	Wood	British	46ea		

H. R. Stevens, Ltd., West Quay, Southampton.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
Morniva		British	20		

Stow & Sons, Shoreham.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
* Osprey Screw Steam Yacht	Wood	British	19	45	70

J. I. Thornycroft & Co., Ltd., Southampton.

Name of Vessel.		Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
Lady of the Lake	Steam	Steel	British	75		225
Suriva Monthon	..	..	Foreign	176		700
Titmouse	..	..	British	72		350
Paso de Obligado		..	Foreign	682		850
Paso de la Patria ..	..	..	,,	682	—	850
H. M. S. Amazon	..			860		15,500
1st-class Torpedo Boats, Nos. 31 and 32	Steam	..		256ea		4,000ea

J. Samuel White & Co., Ltd., E. Cowes.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
14 Vessels	—	British and Foreign Gvts.	2,555	—	32,607

* Compound. † Triple. ‡‡ Compound Surface Condensing.
a Quadruple. m Motor.

Wm. White & Sons, Cowes, I. of W.

Name of Vessel.	Built of	Owners	G.T. Regis.	G.T. inclu. erect.	I.H.P.
* S.Y. Huguenot	Steel	[illegible]			[illegible]
* 50-ft. Admiralty Pinnace	Wood				[illegible]
2 ft. Launch	Steel				[illegible]
* [illegible] ft. Launch	Wood				[illegible]

Cox & Co., Falmouth.

Name of Vessel.	Built of	Owners	G.T. Regis.	G.T. inclu. erect.	I.H.P.
* Tug		British	[illegible]		[illegible]
* Tug			[illegible]		[illegible]
* Yacht			[illegible]		[illegible]
* Ferry			[illegible]		[illegible]
* Tug			[illegible]		
* Tug			77		[illegible]

BRISTOL CHANNEL.

Isaac J. Abdela & Mitchell, Ltd., Brimscombe, Stroud, Glos.

Name of Vessel.	Built of	Owners	G.T. Regis.	G.T. inclu. erect.	I.H.P.
* Valparaiso and Iris	Steel	—	25ea	-	170ea
* Sharpness		British	[illegible]		[illegible]
* Waccma		Foreign	[illegible]		[illegible]
113 and 114			[illegible]		
* Juju	Wood		[illegible]		[illegible]
* Swift		Colonial	[illegible]		[illegible]
* Dingo	Steel	Foreign	[illegible]		[illegible]
* Nos. 1144 to 1147			[illegible]		[illegible]
* Lulu			[illegible]		[illegible]
7 Boats					
9 sets of Engines, totalling					700

C. H. Walker & Co., Ltd., Sudbrook Shipyard, Mon.

Name of Vessel.	Built of	Owners	G.T. Regis.	G.T. inclu. erect.	I.H.P.
Barge	Steel	Foreign	[illegible]		
4-Horse Boats		British	[illegible]		
Barge		Foreign	[illegible]		
* Seadiill		British	[illegible]		[illegible]
2 Barges		Foreign	125ea		
Corvo and Phoca			112ea		[illegible]
2 Barges			[illegible]ea		
Square Sections Nos. [illegible]			[illegible]		
.. .. Nos. [illegible]			[illegible]		

Mordey, Carney & Co., Ltd., Newport, Mon.

Name of Vessel.	Built of	Owners	G.T. Regis.	G.T. inclu. erect.	I.H.P.
Champion	Steel	British	[illegible]		[illegible]

MERSEY.

Cammell, Laird & Co., Ltd., Birkenhead.

Name of Vessel	Built of	Owners	G.T. Regis.	G.T. inclu. erect.	I.H.P.
† Sir Francis Drake	Steel	British	477	—	1,600
† Sir Walter Raleigh			477		1,600
* Eastcock			14[illegible]		[illegible]

Tranmere Works.

Name of Vessel	Built of	Owners	G.T. Regis.	G.T. inclu. erect.	I.H.P.
† Leviathan	Steel	British	[illegible]		[illegible]
Barge	Composite	Foreign	[illegible]		
Barge			[illegible]		
5 Horse Boats	Steel	British	[illegible]ea		
Barge		Foreign	[illegible]		
7 Barges			[illegible]ea		
4 Barges			[illegible]ea		
4 Barges			[illegible]ea		
‡ Igarassu			[illegible]		[illegible]
Barge	Composite		[illegible]		
Barge			[illegible]		
Barge	Steel				
Barge	Composite		[illegible]		
* Launch	Steel		[illegible]		[illegible]
Barge	..	British	[illegible]		
Caisson	..	Foreign	[illegible]		
Caisson			[illegible]		

Dee Shipbuilding Co., Ltd., Queen's Ferry, nr. Chester.

Name of Vessel	Built of	Owners	G.T. Regis.	G.T. inclu. erect.	I.H.P.
2 Twin Screw Tugs	Steel	Foreign	[illegible]ea		[illegible]ea
m Passenger Tender			[illegible]		100
Screw Tug			[illegible]		[illegible]
2 Barges			100ea		
Twin Screw Tug					
Screw Tug			[illegible]		100
Twin Screw Steamer			[illegible]		[illegible]
Screw Disinfecting Steamer			[illegible]		[illegible]
m Yacht	Teak		[illegible]		[illegible]
m Launch			[illegible]		[illegible]
Sailing Lighter	Steel	British	[illegible]		

Messrs. Isaac Pimblott & Sons, Northwich, Cheshire.

Name of Vessel	Built of	Owners	G.T. Regis.	G.T. inclu. erect.	I.H.P.
[illegible] Barges	Steel	Foreign	[illegible]ea		
1 Barge					
* 1 Launch	Wood		[illegible]		[illegible]
* [illegible] Launches			[illegible]ea		[illegible]
2 Barges	Steel		[illegible]ea		
1 Barge			7[illegible]		

Thomas Sumner & Sons, Ltd., Liverpool.

Name of Vessel	Built of	Owners	G.T. Regis.	G.T. inclu. erect.	I.H.P.
‡ Mauco	Wood	British	1[illegible]		

W. Thomas & Sons, Amlish, N. Wales.

Name of Vessel	Built of	Owners	G.T. Regis.	G.T. inclu. erect.	I.H.P.
m Eilian Schooner	Steel	British	140		[illegible]

R. Williamson & Son, Workington.

Name of Vessel	Built of	Owners	G.T. Regis.	G.T. inclu. erect.	I.H.P.
† Ravonia	Steel	British	7[illegible]		
† Skelwith Force			[illegible]02		
* Calatum			27[illegible]		

* Compound. † Triple. ‡ High Pressure. [illegible] Single Cylinder. *m* Motor.

Vickers, Sons & Maxim, Ltd., Barrow-in-Furness.

Name of Vessel.	Type	Owners	G.T. Regis.	G.T. inclu. erect.	I.H.P.
General Guerrero	Transport for Troops.				
Rathlin	[illegible] Cargo Steamer				
Ben-my-Chree	[illegible]				
Two Floating Docks					
Crane Barge					
Machinery for Battleship					
Machinery for 2 Cruisers [illegible]					
Transporter, and other small ships					
	Total Tonnage				[illegible]
	Total Indicated Horse Power				58,850

D. Williams, Portmadoc.

Name of Vessel	Built of	Owners	G.T. Regis.	G.T. inclu. erect.	I.H.P.
Isallt [illegible] Schooner		British	[illegible]		

Wm. J. Yarwood, Northwick, Cheshire.

Name of Vessel	Built of	Owners	G.T. Regis.	G.T. inclu. erect.	I.H.P.
[illegible] Humberto	Steel	Foreign	[illegible]		[illegible]
‡‡ Nixon		British	[illegible]		300
Crocus and Iris	Composite		[illegible] ab		
2 Barges	Steel		[illegible]		
‡‡ Enniscorthy		British	[illegible]		[illegible]
d No. [illegible]		Foreign	[illegible]		20
Lilac, Briar and Tulip	Composite	—	60ea ab		—
‡‡ Belmont	Steel	British	1[illegible]ea		110
No. 11[illegible] Hopper Barge	Wood		[illegible]ab		
‡ No. 108, Boiler and Engines only	—	Foreign	—	-	20
Nos. 71, 72, 73, three sets of Engines		British			25ea

ISLE OF MAN.

Watson Bros., Peel.

Name of Vessel.	Built of	Owners	G.T. Regis.	G.T. inclu. erect.	I.H.P.
Mariad, Lug Rig		British	12		
Mary Immaculate		..	12		

RIBBLE.

Lytham Shipbuilding and Engineering & Co., Lytham, Lancs.

Name of Vessel	Built of	Owners	G.T. Regis.	G.T. inclu. erect.	I.H.P.
[illegible] Alves de Freitas	Steel	Foreign	[illegible]		[illegible]
* Sandbeck		British	[illegible]		[illegible]
* Naragut[illegible]			442		[illegible]
* Scorpion				45 app.	110
Lynn			[illegible]		
Barge		Foreign		60	

ROYAL DOCKYARDS.

H.M. Dockyard, Portsmouth.

Name of Vessel	Built of	Owners	G.T. Regis.	G.T. inclu. erect	I.H.P.
St. Vincent, 1st-class Battleship	Steel				

H.M. Dockyard, Chatham.

Name of Vessel	Built of	Owners	G.T. Regis.	G.T. inclu. erect	I.H.P.
[illegible]00-ton Lighter for oil fuel, C 207	Steel	Full of Oil		[illegible]	
500-ton Lighters for oil fuel C 121				[illegible]	
† Twin-screw tug, Rover				[illegible]	1,[illegible]
d Paddle Tug, Grappler				[illegible]	1,2[illegible]
Submarines, Two					

H.M. Dockyard, Devonport.

Name of Vessel	Built of	Owners	G.T. Regis.	G.T. inclu. erect	I.H.P.
[illegible] Collingwood	Steel			[illegible] specified	

H.M. Dockyard, Pembroke.

Name of Vessel	Built of	Owners	G.T. Regis.	G.T. inclu. erect	I.H.P.
t Boadicea	Steel			[illegible]	18,[illegible]

LIST OF VESSELS ENGINED IN 1908.

Amos & Smith, Hull.

Name of Vessel.	Builders.	I.H.P.	Press. lbs.
‡ Nylghau	Charlton & Doughty ..	4[illegible]	1[illegible]
Chikara	,, ,, ...	470	1[illegible]
[illegible] Staunton	Cook, Welton & Gemmell	[illegible]	1[illegible]
† Touraco & Aracari ..	..	460ea	1[illegible]
Trygon		[illegible]	1[illegible]
† Lundy		270	200
† Cape Town		270	200
† Gibraltar		270	200
† Labrador	Cochrane & Sons	720	180
† Notre Dame de Lourdes		720	1[illegible]
† Vive		500	180
† Celia	Earle's S. & Eng. Co.	270	200
Antonio		270	200
† Hermione	,, ...	270	200
† Shakespeare		27[illegible]	200
* Shetland	Old Vessel	22[illegible]	
	Total	[illegible]	

Baird Bros., North Shields.

Name of Vessel.	Builders.	I.H.P.	Press. lbs.
* Edward Batters	Jos. T. Eltringham & Co.	15[illegible]	1[illegible]0

* Compound. † Triple. ‡ High Pressure. ‡‡ Compound Surface Condensing. *d* Tandem Diagonal. *t* Turbine.

Blair & Co., Ltd., Stockton-on-Tees.

Name of Vessel.	Builders.	I.H.P.	Press. lbs.
† Borborema (T.Screw)	Craig, Taylor & Co., Thornaby ..	1,200	—
† Ro[illegible]	Ropner & Sons, Stockton-on-Tees	[illegible]	
† Dacre Castle	Craggs & Sons, Middlesbrough ..	2,750	—
† Ganecogorta-Mendi ..	Euskalduna Co., Bilbao, Spain ..	1,[illegible]00	
† Hopper No. 4	Ropner & Sons, Stockton-on-Tees	600	
† Fernhill	Richardson, Duck & Co., Thornaby	1,700	
† Dorset Coast	Harkess & Son, Middlesbro' .	675	
† Leeds City .	Ropner & Sons, Stockton-on-Tees	2,2[illegible]	
† Cressington Court	Richardson, Duck & Co., Thornaby	2,1[illegible]	
† Oranos Comp[illegible]	Craig, Taylor & Co., Thornaby ..	1,[illegible]	
† Cabo la Plata ..	Greenock and Grangemouth Dockyard Co., Grangemouth	1,1[illegible]	
† Gascony	Craggs & Sons, Middlesbrough ..	2,2[illegible]	
† Henry R. James ..	Jos. L. Lhompson & Sons, Sunderland	1,900	
† Cabo Blanca	Euskalduna & Co., Bilbao, Spain .	1,1[illegible]	
Cabo C[illegible] .	Wm. Dobson & Co., Low Walker	1,1[illegible]	
	Total ..	24,17[illegible]	

J. W. Brooke & Co., Ltd., Lowestoft.

Fleurette II.	Burnham Yacht Building Co. ..	[illegible]0	
Arab	J. W. Brooke & Co., Ltd.	[illegible]	
Brooke II.	,, ,, ,, ...	120	
[illegible]	.. ..	[illegible]	
[illegible]	Hayward, Southend	[illegible]	
———	J. H. Brookhouse, Nottingham	12	—
———	International Yacht Agency		
———	D. Brown, Newcastle	12	
Sayonara . .	D. Primrose & Co.	12	
——— .	A. E. Sibbick & Co.	12	
Santa Maria (tender)	Stow & Son	12	
Tender (Amsterdam) .	J. W. Burke & Co.	20	
Puffin III.	Phillip & Son .	30	
Josrua (Tender) .	International Yacht Agency ..	12	

Central Marine Engine Works, West Hartlepool.

† Saranac . . .	West Hartlepool ..	2,400	
† Familliaris	Syra	1,400	
† Jervaulx Abbey ..	Hull .	3,400	-
† Stigstad	Christiania .. .	2,500	—
† Kapunda	Melbourne	3,000	
† Harfleur	London .. .	2,000	
† Ocean Queen	Bergen	2,000	—
Norburn	West Hartlepool	1,064	—
	Total .	17,764	

George Clark, Ltd., Sunderland.

SS.'s Antares, Styliani Bebis, Monginevro, Belle Ile, Bedouin, Mervyn, Burwah, Papelera, Mina, Skerne, Ezardian, Patris, Short Bros, No. 347. Total, 13 engines; nominal horse power by Lloyds' Rules, 3,732; estimated indicated horse power, 22,400.

Crabtree & Co., Gt. Yarmouth.

* 4 Boats (Steel)	Crabtree & Co., Ltd. .. .	760	1[illegible]
* 6 Boats (Wood) ..	W. Reynolds & Son .. .	1,10[illegible]	1[illegible]0
* 2 Boats ,, ..	S. Richards & Co., Ltd. .	350	1[illegible]0
* 2 Boats ,, ..	R. Kitto & Son	380	1[illegible]
* 1 Boat (Trawler, Steel)	W. H. Warren	230	130
* 1 Boat (Wood)	G. Thompson	190	1[illegible]0
* 1 Boat	J. Hay	1[illegible]0	140
* 1 Boat .	W. R. McIntosh .	1[illegible]	1[illegible]0
* 3 Boats ,, ...	Fellows & Co., Ltd. ..	570	130
* 2 Boats .. .	Fellows & Co., Ltd.	[illegible]	1[illegible]0
* 2 Boats (Steel)	Cochrane & Son .	380	1[illegible]0
* T.S. Tug ,,	Cochrane & Son	500	1[illegible]
* Coaster ,,	Cochrane & Son	235	1[illegible]
* 4 Engines exported		235	
27 Vessels			
	Total	5,735	

Davis & Co., Ltd., Lowestoft.

‡‡Rosedale .	Duncan	1[illegible]	140
‡‡Herring Fisher	H. Reynolds.	1[illegible]	140

John Dickinson & Sons, Ltd., Sunderland.

S.S.'s Coniston Water, Servian, Lutetian, Esneh, Galatee, Norden. The total Lloyd's Nominal Horse Power, is 2,040. In addition to the above, they have built four extra boilers.

Elliott & Garrood, Ltd., Beccles.

* Zealot L.T.	Jno. Chambers, Lowestoft	1[illegible]	1[illegible]
* 2 Vessels	,, ,, ,,	200ea	17[illegible]
* Holmsgarth, L.T. ..	H. Reynolds, Oulton Broad ..	170	140
* Lerwick, Y.H.	Beeching Bros., Ltd., Gt. Yarm.	170	140
* Freuchny, B.C.K. ..	H. Reynolds, Oulton Broad	170	140
* Vessels	Jno. Chambers, Lowestoft	100ea	1[illegible]
* Cluny, B.C.K.	H. Reynolds, Oulton Road	170	140
* Bartonia, B.C.K. ..	Kitto & Son, Portleven ..	170	140
	Total	[illegible]	

R. & W. Hawthorn, Leslie & Co., Ltd., Newcastle-on-Tyne.

t H.M. 1st-class T.B., No. 22	British Navy	4,000	
Ind[illegible]	[illegible]	3,000	
H[illegible]	,,	3,000	
t H.M.S. Collingwood ..	British Navy	24,[illegible]00	
	Total .	34,500	

Hepple & Co., Ltd., South Shields.

* [illegible]	H[illegible]	1[illegible]	1[illegible]
[illegible]		[illegible]	200
* [illegible]		[illegible]	1[illegible]
	Total .	[illegible]	

* Compound. † Triple. ‡‡ Compound Surface Condensing.
t Turbine.

G. T. Grey, South Shields.

Name of Vessel.	Builders.	I.H.P.	Press. lbs.
††Oxotokb	Sunderland Shipbuilding Co. ..	520	
††Ida Cuneo	A. Vuijk & Sons, Holland ..	920	
††Correct	J. Meijers Shipbuilding Co., Holland	725	
††Kamjford	R. Thompson & Sons, Ltd.	500	-
††Erling and Ronas Hill	A. S. Framnæs mek Værksted ..	350ea	—
††Plumgarth	J. T. Eltringham & Co.	475	—
††Jason	A. S. Framnæs mek Værksted ..	350	—
††Anna Mærsk	A. Vuijk & Sons, Holland	800	
**The Collector	J. T. Eltringham & Co.	475	
††Ragnal	,, ,, .. .	750	
††St. Agnes	,, ,, ,, ...	450	—
* San Sebastian	A. S. Framnæs mek Værksted ..	400	-
††Frigg and Frey ..	,, ,, ,,	350ea	-
††Eimstad	R. Thompson & Sons, Ltd. ..	530	
††Hercules and Samson	Akersmek Værksted	420ea	
‡ Crescent Brand ..	W. Huntley	100	
††Viking and No. 12	Kaldnes Patent Slip and Mek Værksted	400ea	—
	Total ..	10,035	—

Charles D. Holmes & Co., Ltd., Hull.

† Great Admiral	Cook, Welton & Gemmell ..	500	
† 4 Vessels	,, ,, ..	450ea	—
† Median	,, ,,	430	—
† Macfarlane	,, ,,	540	-
† Pekin	Cochrane & Sons .	430	—
† Onward	,, ..	660	—
† Nerves	.. .. . .	520	—
† 2 Vessels		450ea	—
	Total ..	5,780	

T. & J. Hosking, Ltd., Bermondsey.

‡‡ ——— .	British	280	110
‡‡ ———	,,	120	150
f ———	.. .. ..	60	150
‡‡ ———	,, ...	75	110
f ——— .	Foreign	110	120
‡‡ ——— .	British	390	130
‡‡ ———	.. ..	200	120
‡‡ ———	.. ..	80	130
	Total ..	1,315	

MacColl & Pollock, Sunderland.

* Groochill, Charleston, Portinglis and Rouen	Irvine's Shipbuilding Co., Ltd...	10,800ea	180ea
††Baro	W. Harkess & Son, Ltd.	1,000	160
† Copsewood	R. Thompson & Son, Ltd. ..	520	160
† Jamaica	W. Harkess & Son, Ltd. .	1,100	180
††Bida	,, ,, ..	1,000	160
† Kirkland & The Norman	Smith's Dock Co., Ltd.	470ea	180ea
	Total ..	8,880	

North-Eastern Marine Engineering Co., Ltd., Wallsend & Sunderland.

Athinai (twin-screw)	Greece	3,590	
Brika	London	1,935	-
Beaverton	Montreal	930	
Corona	Christiania	1,050	
Corbet Woodall	London	785	
Clara	Nieuport	845	
Cataluna	Sevilla	920	—
Deux Frères	Valognes	580	—
Dacapo	Trondhjem	540	-
Engineer	Liverpool	3,100	
Falk	Tonsberg	1,160	
Flandria	Ghent ..	1,195	
Friesland	Rotterdam ..	660	-
Greenbatt .	Newcastle . ..	1,080	—
Ganda	Ghent ..	1,195	—
Hermione	London	2,600	—
Hyrcania	.. .. ..	2,880	
Harvey Scott .. .	Newcastle	1,080	-
Hampshire	Sunderland	770	—
Ingelfingen & Javorina	Hamburg	1,920ea	—
J. A. McKee . ..	Montreal	1,200	--
Kildin	Archangel	1,080	
Konakry .	Liverpool	2,555	
Luegen	.. ..	2,610	-
Lady Londonderry ..	Seaham Harbour	830	—
La Flandre ..	Bruges	660	—
Mount Stephen	Montreal . .	1,200	—
Milos	Helsingborg	570	
Nippong	Gothenburg	2,920	-
Navarra	Sevilla . ..	920	
Oppurg	Hamburg	1,920	—
Ocean	Sandefjord	2,450	—
Odland	Christiania	835	-
Paul Paix	Middlesbrough	2,250	-
Princess Clementine .	Antwerp	1,660	
Princess Marie Hose ..	,, ...	1,660	
Roi Leopold	,, ...	1,660	
Stamboul	Christiania	1,650	-
San Miguel	,, ...	1,570	
Sir Walter Scott ..	Newcastle	1,080	
St. Johann	Hamburg	1,920	
Trinculo	London . .	2,600	
Tropeiro	Rio Grande	845	--
Melbourne, new Boilers	. . .	1,190	
City of Rochester, New Boilers	.. ..	500	
South American, New Boiler	.. .	160	—
Cawrn, do.	. .	1,330	--
	Total	71,080	

* Compound. † Triple. ** Triple Compound. †† Twin Compound.
‡ High Pressure. ‡‡ Compound Surface Condensing.
f Compound Non-Condensing.

Mumford & Co., Colchester. [illegible] I.H.P. [illegible]

Parsons Marine Steam Turbine Co., Ltd., Wallsend-on-Tyne.

[illegible]

Plenty & Son, Ltd., Newbury.

Name of Vessel.	Builders.	I.H.P.	Press. lbs.
* [illegible]		[illegible]	[illegible]
* [illegible]		[illegible]	[illegible]
	Total	[illegible]	

Richardsons, Westgarth & Co., Ltd., West Hartlepool.

s.s. [illegible]	[illegible]	
s.s. [illegible]	[illegible]	
s.s.'s [illegible]	[illegible]	
s.s.'s [illegible]	[illegible]	
s.s.'s [illegible] and Wetrillo	[illegible] ea	
s.s. [illegible]	[illegible]	
s.s. Queensgarth	[illegible]	
s.s. Mathilde	[illegible]	—
s.s. Ottar	[illegible]	
s.s.'s Fernando [illegible]	[illegible]	
s.s. Arthur	[illegible]	
s.s. Oneida	[illegible]	
	[illegible]	
Large Gas Engines, Steam Turbines, Condensing Plants, Marine and Watertube Boilers	[illegible]	
Total	[illegible]	

W. Sisson & Co., Gloucester.

Majestic	[illegible], Reading	60	[illegible]
‡ Not known [illegible]	[illegible] & Co., Greenwich, S.E.	50	[illegible]
ƒ Viscount	Salter Bros., Oxford	[illegible]	[illegible]
ƒ Not known	[illegible] at Sydney, N.S.W.	[illegible]	[illegible]
ƒ Saint Anthony	Salter Bros., Oxford	[illegible]	[illegible]
* Not known [illegible]	Not known. Engines [illegible]		
ƒ Britannia	Salter Bros., Oxford	[illegible]	[illegible]
‡ Not known	(For Launch at Colombo)	[illegible]	[illegible]

The Vauxhall & West Hydraulic Engineering Co., Ltd., Luton.

‡‡David	Edwards & Co.	440	[illegible]
‡‡Shipped in pieces		300	12[illegible]
‡‡Kinsman	[illegible] Walton & Gemmell	[illegible]	[illegible]
‡‡3 Drifters	Charlton & Doughty	[illegible]	140
ƒ Adur	Forrestt & Co.	[illegible]	[illegible]
‡‡2 Vessels		[illegible] ea	[illegible] ea
‡‡4 Vessels		125 ea	[illegible] ea
‡‡Bowman	[illegible]	[illegible]	130
‡‡Alembe	Forrestt & Co.	[illegible]	120
‡‡Shipped abroad		[illegible]	120
ƒ " "		[illegible]	120
‡‡ " "		[illegible]	120
‡‡ " "		[illegible]	120
	Total	[illegible]	

The Wallsend Slipway and Engineering Co., Ltd., Wallsend-on-Tyne.

+ America	Cantiari Navali Riuniti, Italy	[illegible]	
Carpathian and Roumanian	Sir W. G. Armstrong Whitworth & Co., Ltd.	2,600ea	
Joyo Maru & El Lobo	"	2,700ea	
City of Naples	Messrs. Swan, Hunter and Wigham Richardson, Ltd.	3,200	
Cheyenne	"	2,700	
Conch	"	2,800	—
Petroleine & Clearfield	Messrs. The Tyne Iron Shipbuilding Co.	2,500ea	
Spen	Messrs. W. [illegible] & Co.	[illegible]	
	Total	[illegible]	

SCOTCH.

THE CLYDE, &c.

Ailsa Shipbuilding Co., Ltd., Troon and Ayr.

Name of Vessel.	Built of	Owners	G.T. Regis.	G.T. under erect.	I.H.P.
* Melissa		British	[illegible]		[illegible]
* Bournemouth Queen		"	[illegible]		
* Yosca		"	[illegible]		[illegible]
* E. Hayward	—	"	[illegible]	—	[illegible]
+ Itamba		Foreign	[illegible]	—	[illegible]
3 Sailing Barges		"	[illegible] each		
† Merimbula		Colonial	[illegible]		[illegible]
8 Dumb Barges		Foreign	[illegible] "		
5 Horse Boats, S50-S54		—	[illegible] total dis.		—

Ardrossan Dry Dock and Shipbuilding Co., Ltd., Ardrossan.

5 Steel Horse Boats, S22, S23, S24	Steel	Admiralty			
Screw Steamer, Tintenbar		Colonial	—	[illegible]	
Motor Launch, Comet		British	—		
Stern Wheel Steamers, Etobi and Egori		Foreign	—	150 ea	2,550
Twin Screw Steamer, Tortoise		"			
Tunnel Launch, Chin		Colonial		[illegible]	
4 Horse Boats, S55, S56, S57 and S58	Steel	Admiralty	—	[illegible]	
Steel Screw Tug, No. [illegible]		Colonial		[illegible]	

* Compound. + Triple. ‡ High Pressure.
‡‡ Compound Surface Condensing. ƒ Compound Non-Condensing.

Alley & MacLellan, Ltd., Polmadie, Glasgow.

* [illegible]	Foreign	450	—
* [illegible]	"	[illegible]	
2 [illegible]	"	[illegible]	
1 [illegible]	"	70	
1 [illegible]	"	[illegible]	
2 [illegible]	"	[illegible]	
7 Sailing Barges, Schooner Rigged	"	[illegible]	
6 [illegible] Barges	"	[illegible]	—
* 1 Set Paddle Engines	—		

John Brown & Co., Ltd., Clydebank.

Name of Vessel.	Built for	G.T. Regis.	G.T. under erect.	I.H.P.
Otsuka, Twin Screw	[illegible]	12,[illegible]		
Mirror, Triple Screw	"	[illegible]		
Rambler, Paddle Tug	[illegible]	—		[illegible]
Bellerophon, Armoured Cruiser Machinery only	—	"		[illegible]
Lurentic	—			

Caird & Co., Ltd., Greenock.

a Salsette	Steel	British	[illegible]		10,[illegible]
a Malwa	"	"	[illegible]		13,000

David J. Dunlop & Co., Port Glasgow.

Haiyang, Single Screw	Foreign	[illegible]	1,[illegible]

Wm. Fife & Sons, Fairlie.

Eileen VI	Wood	British	[illegible]	Thames Yacht Measurement	—
Shamrock	Composite	"	170		—
Mariska	"	"	[illegible]		—
Maclue	"	"	20		—
Viola	Wood	"	12		—
Colwell	"	"	[illegible]		—
No. [illegible]	"	—	[illegible]		—

Grangemouth and Greenock Dockyard Co., Greenock.

Castle Eden, Steamer	Steel	British	[illegible]	—	[illegible]
Furnight, Steamer	"	Foreign	4,4[illegible]		[illegible]
Albatros, Tug	"	"	[illegible]		[illegible]

(See also under Forth.)

Wm. Hamilton & Co., Ltd., Port Glasgow.

Waitemata	Steel	British	[illegible]	—	2,800
Medan	"	Foreign	[illegible]	—	2,400

Jas. & John Hay, Ltd., Kirkintilloch, Glasgow.

* Cossack	Steel	British	[illegible]	92	100

A. & J. Inglis, Point House, Glasgow.

a Vasilis	Steel	British	—	1,0[illegible]	2,700
+ Redbreast	"	"		1,31[illegible]	3,200
+ Lambare	"	Foreign		1,[illegible]	1,200
+ Guarany	"	"	—	1,4[illegible]	1,200
+ Maria Parvi	"	British		1,[illegible]	1,500

Lobnitz & Co., Ltd., Renfrew.

* Péluse, Bucket Dredger	—	Foreign	2,064		2,500
* Julio de Castilhos, Screw Tug	—	"	[illegible]		[illegible]
* 4 Hopper Barges, Twin Screw	—	"	671 ea	—	690 ea
* Long Shoot Dredger	—	British	287		600
* Taraba, Stern wheel Steamer	—	"	[illegible]		440
* No. 662, Sandpump Dredger		Colonial	[illegible]		[illegible]
* Actif, Screw Tug		Foreign	[illegible]		300
* 4 Gold Dredgers	—	British	360	—	640
* 6 Patent Rockcutters	—	Foreign and Colonial	[illegible]		[illegible]
Marine Hopper Barge		British	[illegible]	—	
2 Pontoons	—	Foreign	[illegible]		

R. McAllister & Sons, Dumbarton.

Hera	Wood Cutter	British	26	—
Nargie	"	"	27	—
Mouchette	"	"	[illegible]	—
m Launch	—	—	[illegible]	—

Peter MacGregor & Sons, Kirkintilloch.

‡‡No. 2[illegible], Tug	Steel	British	45		250
‡‡No. 2[illegible], Tug	"	Colonial	[illegible]	—	250
‡‡Sacramento, Launch	"	Foreign	[illegible]	—	[illegible]
‡‡No. [illegible], Tug	"	"	[illegible]	—	150
‡‡Levrel Bahr, Tug	"	"	[illegible]	—	300
‡‡No. [illegible], T.S. Tug	"	Colonial	[illegible]	—	300
‡‡Elder, Tug	"	"	30	—	150
‡‡No. [illegible], Barge	"	"	25		

Mackie & Thomson, Ltd., Govan, Glasgow.

* 12 Drifters	Steel	British	[illegible] ea	280 ea
* Enzie	"	"	[illegible]	200
* 3 Trawlers	"	Foreign	237 ea	480 ea

Archd. McMillan & Son, Ltd., Dumbarton.

Warrista	Steel	Foreign	3,[illegible]	
Kinnaird	"	British	2,112	—
[illegible]	"	"	2,[illegible]	
Prince Rupert	"	"	[illegible]	
1 Tugboat, shipped abroad	—		150	—

A. Munro, Ardrishaig.

White Heather, Lugsail and Jib	British	[illegible]
m Mo Leannan		[illegible]

Murdoch & Murray, Port Glasgow.

* Tucháni	Steel	Foreign	2[illegible]

Ritchie, Graham & Milne, Whiteinch.

2 Pontoons	Steel	Foreign	
1 Sailing Barge	"	"	[illegible]
1 Launch	"	Colonial	[illegible]
1 Stern Wheel Steamer	"	Foreign	[illegible]
1 Stern Wheel Steamer	"	"	

A. Robertson & Co., Sandbank, S.O., Argyllshire.

m Galma	British	[illegible]	Thames Meas'm't	—
m Sunbeam, Sailing Cutter	"	10		100
Corrie, Sailing Cutter	"	10		—
Mimi, Sailing Cutter	Foreign	[illegible]		—
m The Virginian	"	[illegible]		12 B.H.P.

* Compound. + Triple. ‡‡ Compound Surface Condensing.
a Quadruple. m Motor. t Turbine.

A. Rodger & Co., Port Glasgow.

[illegible]	Built of	Owners	G.T. Regis.	G.T. inclu. erect.	I.H.P.
[illegible] Deck Coaster		British	[illegible]		[illegible]
[illegible] Single Deck Collier		,,	1,0[illegible]		1,1[illegible]

Scott & Sons, Bowling.

[illegible]	Steel	Foreign	[illegible]		2[illegible]
[illegible]en Victoria		British	[illegible]		[illegible]
Lochinvar			[illegible]		[illegible]
* Leone			[illegible]		[illegible]
* Lochiel			[illegible]		[illegible]
* Midle			[illegible]		[illegible]
* Nos. 209, 210 [illegible] 211			[illegible]		[illegible]ea
* Marena			[illegible]		[illegible]
* Agnes Ellen			286		2[illegible]

Barclay Curle & Co., Ltd., Glasgow.

Russia		Foreign	5,[illegible]97		7[illegible]
Morea		British	10,8[illegible]		1[illegible]
Waratah			9,[illegible]		6,800
Greenlaw			[illegible]		1,4[illegible]
Bandon		Foreign	[illegible]900		2,100
Champion		,,	[illegible]900		2,100

William Beardmore & Co., Ltd., Naval Construction Works, Dalmuir.

[illegible] Orcoma		British	11,[illegible]		10,000

W. Chalmers & Co., Rutherglen.

3 Stern-wheel Steamers, hulls only		Foreign	[illegible]		
‡Chalmers Tug, [illegible] & A		British	[illegible]		20[illegible]
Kylesku Ferry			10		

Clyde Shipbuilding and Engineering Co., Ltd., Port Glasgow.

Acadian, S.S.		Colonial	2,30[illegible]		1,000
Bellambi, S.S.		,,	1,162		1,100
Sabbia, S.S.		Foreign	2,802		1,600
Beulah, S.S.		Colonial	[illegible]		1,000
Yoseric (Machinery only) ..	—	British	—		2,100

Charles Connell & Co., Ltd., Scotstoun.

Killin		British	[illegible]54		1,8[illegible]
Cadiz		Foreign	[illegible]436		1,5[illegible]
Barcelona		,,	[illegible]441		1,500
Sutlej		British	[illegible]54[illegible]		2,100
Centurion		,,	[illegible]94		2,700
Merchant			[illegible]682		1,700
Florizel		,,	[illegible]100		[illegible]200

D. M. Cumming, Blackhill Shipyard, Glasgow.

11 Barges			157		

Wm. Denny & Bros., Leven Shipyard, Dumbarton.

No. 18 T.B.D.		British Government	24		
No. 2[illegible]		,,	250		
No. 30		,,	250		
Otaki, C.T.S.		Colonial	7,420		
Flats, Barges, Pontoons, Steamers and Launches Shipped abroad			12,710		

The Fairfield Shipbuilding and Engineering Co., Ltd., Govan, Glasgow.

Princess Charlotte	Steel	Colonial	[illegible]		[illegible]
Lady Fraser	,,	,,	17,[illegible]20		20,400
Otway	,,	British	[illegible]		[illegible]

Ferguson Bros., Newark Shipyard, Port Glasgow.

* Datent (Tug)		British	172	17[illegible]	[illegible]
Finnieston No. [illegible] (Ferry)		,,	[illegible]79	[illegible]	500
* Dredger		Colonial	45[illegible]	[illegible]	6[illegible]
* Apapa (Tug)		,,	9[illegible]	[illegible]	4[illegible]
* Dredger No. 7		British	8[illegible]	[illegible]	7[illegible]
North Western (Dredger)			574	[illegible]	1,200
* Flying Serpent (Tug)		,,	250	250	900
* Flying Cormorant (Tug)			2[illegible]	[illegible]	[illegible]
* Dredger, shipped abroad		Foreign	2[illegible]7	[illegible]	[illegible]

J. Fullerton & Co., Paisley, N.B.

Remus	Steel	British	1,07[illegible]	[illegible]	[illegible]
* Camaguey		Foreign	47	47	17[illegible]
* T[illegible]nsberg		,,	127	127	180
Aripawa		Colonial	201	201	[illegible]70
* Letty		British	[illegible]	[illegible]	[illegible]

Fleming & Ferguson, Ltd., Paisley, N.B.

[illegible] Steam Yacht	Steel	British		1[illegible]	[illegible]00
* Huanton (Dredger)				[illegible]00	1,000
* S[illegible] (Paddle Steamer)				[illegible]00	700
* Gunga ,,	,,	,,	—	300	700
Six Barge (Dredger)		,,		200	[illegible]00
† Tho. Awhnia (G. Tug) ..	,,	,,	—	300	1,100
Isabella (G. Tug)				150	[illegible]
2 Towing Barges	,,	Foreign		1,200	—
No. [illegible], Hopper Steamer				700	[illegible]00
4 Sets Engines shipped to Canada		British			[illegible]

David & William Henderson & Co., Ltd., Partick, Glasgow.

Taormina (Twin-screw)	Steel	Foreign	5,921		7,790
Elysia (Screw)		British	[illegible]		4,[illegible]00
Bellaventure		Colonial	1,1[illegible]2		2,100
No. 46		British	1,1[illegible]		2,20[illegible]
[illegible] Barges (Towing)			2[illegible]4		

Napier & Miller, Ltd., Old Kilpatrick.

Tamarac, S.S.		British	264		2,[illegible]
Baron Minto, S.S.			[illegible]		2,200
Cadillac, S.S.			[illegible]26[illegible]		2,300
Bonaventure, S.S.		Colonial	1,1[illegible]		2,0[illegible]

John Reid & Co., Ltd., Whiteinch, Glasgow.

* M[illegible]	Steel		400		200
[illegible]	Teak		1[illegible]		[illegible]

Scotts' Shipbuilding & Engineering Co., Ltd., Greenock.

[illegible]	Steel		1,28[illegible]	Y.M.	2,500
[illegible]	,,		[illegible]		1,500

* Compound. † Triple. ‡* Compound Surface Condensing. *m* Motor. *t* Turbine.

Russell & Co., Port Glasgow.

Name of Vessel.	Built of	Owners	G.T. Regis.	G.T. inclu. erect.	I.H.P.
Columbia (Spar deck Emigrant & Cargo Steamer)		Foreign	[illegible]452		
Georgia (Spar deck Cargo Steamer)			[illegible]427		
Atlanta (Spar deck Emigrant and Cargo Steamer)			1,[illegible]		
Bannockburn (Spar-deck Cargo Steamer)		British	1,[illegible]		
Gloria de Larrinaga (Shelter-deck Cargo Steamer)			4,04[illegible]		
Ventura de Larrinaga do.			4,04[illegible]		
Victoria de Larrinaga do.		,,	4,04[illegible]		
Yoseric (Spar-deck Cargo and Passenger Steamer) ..		,,	4,463	—	—
Rinaldo (Spar-deck Cargo Steamer)			[illegible]21		
Dondo Do.		Foreign	[illegible]97[illegible]		
Princess Thyra (Coasting Steamer)		British	[illegible]00		
No. 596 (Twin-screw light draft Passenger Steamer)			[illegible]00		
No. [illegible], do.			20[illegible]		

Wm. Simons & Co., Ltd., Renfrew.

Sand Pump Dredger		Foreign	8[illegible]		[illegible]500
,, ,,		,,	[illegible]		1,900
Grab Hopper Dredger		British	[illegible]		860
2 Sand Pump Dredgers ..		Foreign	890ea	—	4,200ea
8 Hopper Barges		,,	200ea		
Bucket and Pump Hopper Dredger	—	Colonial	648	—	1,350
Sand Pump Hopper Dredger	—	,,	355	—	930
,, ,, ,,		,,	225	—	690
Special Service Steamer		Foreign	800		950
14 Pontoons			[illegible]90 total		

Alexander Stephen & Son, Ltd., Littlehouse, Glasgow.

Mourilyan (Schooner)		Colonial	1,348		
a Makura ,,		,,	8,07[illegible]		20,000
† Koombana ,, ...		,,	4,500	—	
† Bruxellesville		Foreign	[illegible]980		

Paul Jones, Son & Co., Greenock.

m Olive					20
m Union Star			[illegible]		[illegible]
m Lady Clare			[illegible]		14
m Cassandra					[illegible]

Bow, McLachlan & Co., Ltd., Paisley.

Hock Lee (Single Screw) ..	—	Foreign	323	-	500
7 Barges (Sailing)		Colonial	[illegible]		
Kangaroo (Single Screw)		Foreign	[illegible]		130
Lighter (Sailing)		Colonial	[illegible]		
[illegible] Barges (Sailing)			[illegible]		
6 Barges (Sailing)			24		
Water Boat (Single Screw)		,,	168	—	250
1 Barges (Sailing)			[illegible]		
Lighter (Sailing)			[illegible]		
Steam Launch (Single Screw)			1[illegible]		80
* Engines for H.M.S. Grappler	—		—		1,250
* ,, ,, Rover	—		—	—	1,400
Engines shipped abroad					700

Yarrow & Co., Ltd., Scotstoun, Glasgow.
(formerly of Poplar, London)

[illegible] Twin-screw ocean-going Destroyers, 240′ × $23\frac{1}{2}$′, fitted with two sets triple-expansion compound engines		Foreign	[illegible]ea		[illegible],000
2 Motor Gunboats for river service, 60′ × 9′	—	,,	16ea	—	350
1 River Gunboat, 12[illegible]′ × 20′			10[illegible]		250
1 Screw Steamer for Postal service, [illegible]0 × 14			[illegible]		180
1 Sternwheel commercial passenger steamer, 132′ by [illegible]			[illegible]		[illegible]
1 Single Screw commercial raised propeller Steamer, [illegible] × 10			[illegible]		150
1 Single Screw Launch, [illegible]′ by $6\frac{1}{2}$′ (to have Internal Combustion Engines)		Colonial	[illegible]		
Motor Boat, 60′ × 7			[illegible]		[illegible]
Motor Torpedo Boat, 100′ × $13\frac{1}{2}$′			[illegible]		700

All vessels built of steel.

THE FORTH, &c.

John Cran & Co., Leith.

Name of Vessel.	Built of	Owners	G.T. Regis.	G.T. inclu. erect.	I.H.P.
* Steam Tugs, Hornby and Egerton	Steel	British	168 ea		750 ea

* Compound. † Triple. *a* Quadruple. *m* Motor.

Grangemouth and Greenock Dockyard Co., Grangemouth.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
† Grangemouth, Schooner ..	Steel	British	1,[illegible]	–	2,[illegible]
Horse Flats, S25, S26, S27, S28 and S29	,,	Admiralty	50	–	
† Bartlett, Tug	,,	British	[illegible]	–	900
† Cabo la Plata, Screw Steamer	,,	Foreign	2,002	–	960
† Oneida, Screw Steamer .	,,	British	[illegible]	-	640

See also under Clyde.

Ramage & Ferguson, Ltd., Leith.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
† Iolanda	Steel	Foreign	1,047	—	3,[illegible]
† Karuah	,,	Colonial	[illegible]	-	[illegible]

Scott of Kinghorn, Ltd., Kinghorn.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
† Passenger	–	Colonial	1,2[illegible]7	—	2,700
† Passenger and Cargo	—	,,	1,310	—	1,[illegible]0
† Passenger and Cargo	—	,,	907	-	1,150

J. Weatherhead, Eyemouth.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
Twilight, Fishing Boat	Wood	British	40	—	–
Mary Maltman, Steam Fishing Boat ..	,,	,,	50	—	–
m Boat 23 ft. × 6 ft. × 3 ft.	—	—	—	—	—

Hawthorns & Co., Ltd., Leith.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
Elcho	Steel	British	155	—	400
"S"	,,	,,	75	—	55

John Robertson, St. Monans.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
* Mackays (Steam	—	British	83	—	—
Mary Ann Bruce (Sailing)	—	,,	24	–	—
Blue Bell .. ,,	—	,,	24	—	—
Davidson's ,,	—	,,	33	—	—

THE TAY, &c.

The Caledon S. and E. Co., Ltd., Dundee.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
† Triad .	Steel	British	1,401		[illegible]
† Hilary ..	,,	,,	6,400	—	[illegible],000
† Lady McCallum	,,	,,	1,000	—	1,000
† Ipoh	,,	Colonial	1,280	—	1,500

The Dundee Shipbuilding Co., Ltd., Dundee.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
† Vera Grace, Screw Trawler	Steel	British	232	—	400
* Portlethen, Steamer	Composite	,,	140	—	160
† Tropeiro, Screw Steamer ..	Steel	Foreign	1,367	—	845
† Gwyneth, Screw Trawler		British	252	—	400
† La Flandre, Screw Steamer	,,	Foreign	7[illegible]5	—	600
* Tillydrine and Myrtlebank ,,	,,	British	321ea	—	350ea
* Moorside ,,	,,	,,	311	—	350
† Salome, Screw Trawler ..	,,	,,	252	—	430
† Tay and Tyne, Screw Steamer	,,	,,	560	—	750
* Summersgill, ditto	,,	,,	2[illegible]0	—	270

Gourlay Bros. & Co. (Dundee), Ltd., Dundee.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
† Titania	Steel	Foreign	3,470	—	4,000
† Baron Gautsch	,,	,,	2,000	—	4,000
† Prinz Hohenlohe	,,	,,	2,000	-	4,000

Montrose Shipbuilding Co., Montrose.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
† Julian Alonso, Fore and Aft Rig.	Steel	Foreign	—	1,627	—
* Kilmany and Carmi III. do.	,,	British	-	110ea	220ea
* Mars, do.	,,	Foreign	—	110	220
* Knole do.	,,	British	—	100	227
* Nos. 33 and 34, do.	,,	,,	—	450ea	—

THE DEE.

Alexander Hall & Co., Ltd., Aberdeen.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
Pitblae and Zaberdour, Drifters	—	British	[illegible]ea	—	200ea
Fragrant .. ,,	—	,,	94	—	200
Lupina and Protect Me ,,	—	,,	88ea	—	200ea
Guerdon ,,	—	,,	[illegible]	-	220
Rose III. ,,	—	,,	55	-	220
Spurnpoint, Cargo Vessel ..	—	,,	235	—	390
Cormorant I. and Pelican I., Trawlers	—	,,	247ea		450ea

Hall, Russell & Co., Ltd., Aberdeen.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
2 Trawlers	—	Foreign	270ea	—	700ea
2 Trawlers ..	—	British	21[illegible]ea	—	450ea
2 Drifters ..	—	,,	77ea	—	220ea
Firth ..	—	,,	400	—	620
Loch Esk	—	,,	215	—	450
Dorothy Gray	—	,,	1[illegible]	—	450
Kervado ..	—	Foreign	17[illegible]	—	420
Jessie Nutten	—	British	187	—	400

LIST OF VESSELS ENGINED IN 1908.

J. Abernethy & Co., Aberdeen.

Name of Vessel.	Builders.	I.H.P.	Press. lbs.
* Port Lethen	Dundee S.B. Co.	240	150
* 10 Vessels	J. Duthie Torry S.B. Co.	220ea	150ea
* Magnet III.	,, ,,	240	150
† Star of Britain	,, ,,	420	180
† Lydian	,, ,,	420	180
	Total	3,520	

Cooper & Greig, Dundee.

Name of Vessel.	Builders.	I.H.P.	Press. lbs.
4 Sets Compounds ..	Home Owners	700	—
2 Sets Triples (Twin-Screw) ..	Foreign Owners	1,400	—
		2,100	

* Compound. † Triple. m Motor

Aitchison, Blair & Co., Clydebank.

Name of Vessel.		I.H.P.	Press. lbs.
‡‡Twin-screw	Foreign	280	[illegible]
‡‡ ,,		[illegible]	1[illegible]
‡‡Single Screw	,,	100	120
‡‡Twin ,,	,,	[illegible]	1[illegible]
/ Single ..	,,	[illegible]	120
‡‡ ,, ,,	,,	[illegible]	120
/ ,, ,,	,,	[illegible]	120
‡‡ ,, ,,	,,	[illegible]	[illegible]
‡‡ ,, ,,	,,	[illegible]	[illegible]
9 Vessels	Total	1,700	

Campbell & Calderwood, Soho Engine Works, Paisley.

Name of Vessel.		I.H.P.
11 sets Screw Engines	Shipped abroad	1,[illegible]
1 set side wheel paddle Engines	,,	70
5 sets Stern Wheel do.	,,	830
17 sets	Total	2,[illegible]

Miller & Macfie, Glasgow.

Name of Vessel.	Builders.	I.H.P.	Press. lbs.
‡‡Tayr-El-Bahr	P. McGregor & Son	320	—
‡‡Salvador	Dee Shipbuilding Co., Ltd.	320	—
‡‡Shipment		220	—
‡‡ ,,		[illegible]	—

J. Cran & Co., Leith.

Name of Vessel.	Builders.	I.H.P.	Press. lbs.
* Steam Tugs Hornby and Egerton	John Cran & Co.	780ea	120ea
* Maggie Lough and Lizzie Hutt	Jas. Miller, Anstruther	220ea	140ea
	Total	2,000	

Denny & Co., Dumbarton.

Name of Vessel.	Description of Machinery.	Service.
No. 18 Destroyer	Turbine	British Admiralty
Tofua	Triple Twin-Screw	Colonial
Bhamo	Triple Single Screw	Eastern
No. 29 Destroyer	Turbine	British Admiralty
No. 30 Destroyer ..	Turbine	British Admiralty
Otaki	Triple Twin-Screw and Low Pressure Turbine	Colonial

Also a number of Sets of Stern and Side Paddle Wheel, and Twin-Screw Machinery for Steamers, Launches and Tugs, built abroad.

Total Indicated Horse-Power, 57,100.

Dunsmuir & Jackson, Ltd., Glasgow.

Name of Vessel.	Builders.	I.H.P.	Press. lbs.
† Grangemouth	The Greenock and Grangemouth Dockyard Co., Ltd.	3,000	
† Killin	Chas. Connell & Co., Ltd.	1,9[illegible]0	
† Waitemata	Wm. Hamilton & Co., Ltd.	2,800	
† Baron Minto	Napier & Miller, Ltd.	2,200	
† Centurion ..	Chas. Connell & Co., Ltd.	2,700	
† Merchant	,, ,, ,,	2,000	–
† Florizel	,, ,, ,,	2,350	—
† Princess Thyra .	Russell & Co.	1,000	
	Total ..	18,000	–

Fisher & Co., Paisley.

Name of Vessel.	Builders.	I.H.P.	Press. lbs.
‡‡Dolphin	P. McGregor & Sons, Kirkintilloch	225	130
‡‡Name not known yet	,, ,, ,,	225	130
‡‡Eider	,, ,, ,,	140	120
‡‡Tonsberg	J. Fullerton & Co., Paisley ..	190	130
‡‡Name not known ..	Shipment order	240	130
	Total	1,020	--

Gauldie, Gillespie & Co., Glasgow.

Name of Vessel.	Builders.	I.H.P.	Press. lbs.
* Desire	Herd & McKenzie, Findochty ..	160	130
* Enzie	Mackie & Thomson .	200	180
* 6 Vessels	Scott & Sons, Bowling ..	2[illegible]ea	130ea
† Mara Smith	Smith, Buckie	200	180
* Mercedes	Brown & Co., Greenock ..	400	130
* Lythe	Larne Shipbuilding Co.	110	110
	Total ..	2,450	

Hutson & Sons, Ltd., Glasgow.

Name of Vessel.	Builders.	I.H.P.	Press. lbs.
† Ruth and Matouba ..	W. Walker	[illegible]ea	
† Driva	Campbeltown Shipbuilding Co.	850	-
† Julian Alonso	Montrose Shipbuilding Co.	1,250	—
† Tintenbar	Ardrossan Dry Dock and Shipbuilding Co., Ltd.	700	
† Bournemouth Comp. Diag.	Ailsa Shipbuilding Co., Ltd. ..	1,0[illegible]	-
	Total ..	4,950	

John G. Kincaid & Co., Ltd., Clyde Foundry, Greenock.

Name of Vessel.	Builders.	I.H.P.	Press. lbs.
† Columbia & Georgia .	Russell & Co., Port Glasgow ..	2,800ea	-
† Dondo	,, ,, ..	2,350	
† Purelight	Greenock and Grangemouth Dockyard, Co., Ltd., Greenock	2,650	
† Wacousta	Arch. McMillan & Son, Ltd., Dumbarton	2,250	
	Total	12,850	

Menzies & Co., Leith.

Name of Vessel.	Builders.	I.H.P.	Press. lbs.
* Steam Herring Drifter	J. & G. Forbes, Sandhaven	214	140
* Steam Herring Drifter	,, ,,	1[illegible]	140
* Steam Herring Drifter	G. Innes & Sons, Portknockie	1[illegible]4	130
* 2 Steam Herring Drifters	Mackay Brothers, Alloa ..	260ea	130ea
	Total	1,057	

* Compound. † Triple. ‡‡ Compound Surface Condensing.
/ Compound Non-Condensing.

W. V. V. Lidgerwood, Coatbridge.

Name [illegible]	Builders.	I.H.P.	Press. lbs.
† [illegible]	Goole Shipbuilding Co., Goole	[illegible]ea	—
[illegible] Gwyneth, and Salome	Dundee Shipg. Co., Dundee	[illegible]ea	
[illegible] & Tillyaine	,, ,,	440ea	—
† 5 Vessels	Smiths Dock Co., North Shields	420ea	—
2 ,,	,, ,,	[illegible]ea	
* Vessel	,, ,,	240	—
‡ 2 ,,	,, ,,	400ea	—
† Neptune, Bayard and Suze Marie	Mackie & Thompson, Ltd., Govan	[illegible]ea	—
* 12 Vessels	,, ,,	[illegible]ea	—
† Comoran	,, ,,	480	—
† Hebden	John Duthie Terry	470	—
† Aboyne	,, ,,	400	—
* 2 Vessels	Montrose Shipg., Montrose	280ea	—
* Chance	D. R. Simpson, Wick	280	—
	Total	14,150	

S. & H. Morton & Co., Leith.

* "[illegible]" (Lighter)	S. & H. Morton & Co.	[illegible]	100

Muir & Houston, Ltd., Glasgow.

† Fagona	Archd. McMillan & Son, Dumbarton	[illegible]00	—
† Prince Rupert and Kinmount	,, ,, ,,	[illegible]50ea	—
† Lady Sybil	G. Brown & Co., Greenock	1,200	—
† Bartlett	Greenock and Grangemouth Dockyard Co.	1,[illegible]	
	Total	[illegible],000	

Rankin & Blackmore, Greenock.

† Bannockburn	Russell & Co.	2,700	180

Renfrew Bros. & Co., Irving.

* Ardnagrena	G. Brown & Co., Greenock	400	13[illegible]
† Arapawa	John Fullerton & Co., Paisley...	400	1[illegible]
† For Shipment	.. ..	[illegible]	13[illegible]

A. Rodger & Co., Engineers, Govan.

Felspar	A. Rodger & Co., Port Glasgow	800	
* Ngahere	,, ,, ,,	1,100	
	Total	1,900	

Ross & Duncan, Govan.

Turned out 42 sets of Marine Engines of 12,950 horse power. Of these 13 sets of 7800 horse power were fitted in the following Vessels:—Agnes Ellen, Carlingford, Camaguey, Calatum, Letty, Lochiel, Madie, Marena, Ravonia, Remus, Rhona, Rosaleen and Skelwith Force; and 29 sets of 5150 horse power were shipped abroad. In addition to Boilers for the above engines, 15 boilers of 4300 horse power were constructed during the year.

Messrs. McKie & Baxter, Glasgow, have turned out marine machinery totalling 6,920 I.H.P.

David Rowan & Co., Glasgow.

Ternate and Medan	Wm. Hamilton & Co., Ltd.	[illegible],000ea	180ea
Shipment	Shipped abroad	120	120
Cadiz and Barcelona	Chas. Connell & Co., Ltd.	4,700ea	180ea
Atlanta	Russell & Co.	2,850	180
Helga	Dublin Dockyard Co.	1,200	1[illegible]
Sutlej	Chas. Connell & Co., Ltd.	[illegible]	200
Tamarac and Cadillac	Napier & Miller, Ltd.	2,500ea	1[illegible]ea
Transporter	Vickers, Sons & Maxim, Ltd...	720	1[illegible]
Gloria de Larrinaga and Ventura de Larrinaga	Russell & Co.	2,800ea	1[illegible]ea
Rinaldo	,,	2,300	180
Trieste and Split	Cantiere Navale Triestino..	1,250ea	180ea
Bonaventure	Napier & Miller, Ltd.	2,200	200
Leviathan	Tranmere Bay Development Co.	3,[illegible]00	180
	Total I.H.P.	43,890	

Also 45 marine boilers for shipment. Total I.H.P., 18,000.

IRISH.

The Dublin Dockyard Co., Dublin.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
No. 61, Dumb Barge	Steel	British	1[illegible]7	—	—
T.S.S. Helga	,,	,,	[illegible]23	—	1,050
S.S. Rosaleen	,,	,,	[illegible]	—	[illegible]
S.S. Rhona	,,	,,	[illegible]	—	[illegible]

Harland & Wolff, Belfast.

a Memphian	Steel	British	6,305		2,700
a [illegible]	,,	Foreign	[illegible]	—	13,600
a [illegible]	,,	British	[illegible]	—	2,800
a Lapland	,,	Foreign	1[illegible]	—	13,000
a [illegible]	,,	,,	[illegible]	—	4,340
a [illegible]	,,	British	[illegible]	—	9,700
a [illegible]	,,	,,	1[illegible]	—	10,000
a [illegible]	,,	,,	[illegible]	—	9,700

The Larne Shipbuilding Co., Larne.

* Principal, Steam Drifter	Steel	British	91	—	38
* [illegible]	,,	,,	130	—	17

* Compound. † Triple. a Quadruple.

Workman, Clark & Co., Ltd., Belfast.

[illegible]	Steam	Steel	Foreign	3,192	—	3,000
Verona	,,	,,	,,	8,886	—	7,500
Cartago	,,	,,	British	4,937	—	3,800
Parismina	,,	,,	,,	4,937	—	3,800
Heredia	,,	,,	,,	4,943	—	3,800
Perseus	,,	,,	,,	6,728	..	5,000
Theseus	,,	,,	,,	6,72[illegible]	..	5,000
Tainui	,,	,,	,,	9,957	—	6,500

FRENCH.

Ateliers et Chantiers de Normandie à Grand-Quevilly, nr. Rouen.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
† Sainte Adresse	Steel	Hâvre	3,050	—	2,400
† Guatemala	,,	,,	3,050	—	2,400
Carabinier T.B.D.		French Navy	—	—	—

Baheux Bros., Boulogne-Sur-Mer.

St. Joseph	Wood	Boulogne	—	88	—
Hache d' Alliance	,,	,,	—	76	—
† L'Amerique	—	,,	—	400	670

L'Anonymes des Chantiers et Ateliers de la Gironde, Bordeaux.

t Basra, T.B.	Steel	—	—	—	7,000
t Tirailleur, T.B.	,,	—	—	—	8,000

Augustin Normand, Le Havre.

t Chasseur, T.B.D.	—	French National Marine	435	—	7,200
t Cavalier	—	,,	445	—	8,600
t Boucher	—	,,	645	—	13,500

Mediterranean Shipbuilding Works, La Seyne.

† Parana	Steel	Marseilles	6,817	—	5,600
† 2 Boats	,,	Dakar	205ea	—	—
† Vessel	,,	Toulon	85	—	—
† 4 Vessels	,,	,,	110ea	—	—
† 4 Vessels	,,	Bizerte	110 ,,	—	—
* Vessel	,,	Brésil	6	—	20
* Etang	,,	Toulon	145	—	250
* Fleuve	,,	Lorient	145	—	250
* Zebre and Tapir	,,	Toulon	126ea	—	400ea
* Niger	,,	Port Said	158	—	250

Schneider & Co., Creusot.

† 4 Revenue Boats	—	Turkey	192ea	—	330ea
6 Torpedo Boats	—	Bulgaria	97ea	—	1,900ea

Societe Anonyme des Chantiers de St. Nazaire, Penhoet.

† Texias	Steam	— Havre	6,674		3,450

Societe Anonyme des Chantiers et Ateliers de Provence, Port de Bouc.

† Caroline	Steel	Le Hâvre		5,000	4,200
† Maroni	,,	,,	—	4,200	1,700

LIST OF VESSELS ENGINED IN 1908.

Caillard et Cie, Le Havre.

Name of Vessel.	Builders.	I.H.P.	Press. lbs.
† Europe	Baheux frères Boulogne-sur-mer	650	200
† Amerique	,, ,, ,,	750	200

BELGIAN.

Chantiers Navals Anversois, Hoboken-by-Antwerp.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
† ss. Ingelfingen	Steel	Hamburg	3,391	4,000ab	1,750
,, Saint Johann and Oppurg	,,	,,	ea3,389	ea4,000ab	1,750ea
,, Javorina	,,	,,	3,387	4,000ab	1,750

Charles Delsaux, Boom.

† Remorqueur III...	Steel	Paris	137	160	350
Moulins Hoir Dy-Lebegue I.	,,	Charleville	380	422	—
Remy VI.	,,	Louvain	300	328	—
Elvira and Ida	,,	Antwerp	460ea	513ea	—
m Jeune Louis	,,	,,	160	182	35
Marie Germaine	,,	,,	375	422	—
m Tetard de Saventhem	,,	,,	13	22	40-50
Loraine III. and IV.	—	Nantes	13ea	19ea	25-30ea
Clara	Steel	St. Amand	375	422	—
m Neptunus II.	,,	Antwerp	31	42	28
Boni	,,	,,	380	422	—
m Carabas	,,	Mons	12	18	14
m Mississipi	,,	Bruxelles	52	73	18
m Pauline	—	Antwerp	12	17	15
m Embarcation de Sauvetage	—	Zee-Brugge	21	29	35-40
m Juniper II.	—	Antwerp	20	28	24-30

Societe Anonyme John Cockerill, Hoboken.

‡ Stern Wheel	Steel	Congo	24	28	65
Nos. 380 to 387, 8 Barges..	,,	Turkey in Asia	—	145ea	—
‡ Mamberé, Stern Wheel	,,	Congo	17	20	65
‡ Pilote ,,	,,	China	17	20	65
† No. 477 (Paddle)	,,	Russia	700	1,325	900
‡ No. 478 (Screw Tug)	,,	Congo	—	7	30
‡ No. 479 (Screw Tug)	,,	,,	—	13	30
‡ Nos. 481-482, 2 Stern-Wheels	,,	,,	24ea	28ea	65ea
m No. 483, Athena..	,,	Antwerp	—	9	20
No. CCCCV. (Barge)	,,	Belgium	—	110	—
No. CCCCVIII. ,,	,,	,,	—	118	—

* Compound. † Triple. ‡ High Pressure.
a Quadruple. m Motor. t Turbine.

DUTCH.

Arnhem Co., Arnhem.

Name of Vessel.	Built of	Owners	G.T. Regs.	G.T. inclu. erect.	I.H.P.
Newa	Tug	Amsterdam	1[illegible] dis	27 dis	—
† Frederika	,,	Dordrecht	[illegible] ,,	[illegible] ,,	—
† Else	,,	[illegible]	1[illegible] ,,	[illegible]00 ,,	—
† Flotille	,,	Antwerp	23[illegible] ,,	4[illegible] ,,	—
† Gelria	,,	Rotterdam	[illegible] ,,	[illegible] ,,	—
† Atlas IV.	,,	Lattich	14[illegible] ,,	[illegible]00 ,,	—
† Wesselina	,,	Arnhem	[illegible] ,,	190 ,,	
† Marcel	,,	Dinant	14[illegible] ,,	300 ,,	—
† Dir. L. Gutjahr VII	,,	Dordrecht	2[illegible] ,,	450 ,,	—
† Arthur	,,	Antwerp	[illegible] ,,	150 ,,	—
† Hendrik	,,	Dordrecht	23[illegible] ,,	4[illegible] ,,	—
A Sailing Schooner		S. America	1[illegible] ,,	—	—
* Vartje Knap (Cargo)		Bruges	engine only		[illegible]0
† Betha (Tug)	—	Mannheim			200

H. H. Bodewes, Millingen, Holland.

Name of Vessel.	Built of	Owners	G.T. Regs.	G.T. inclu. erect.	I.H.P.
Maria Mathilda	Steel	Germany		650	
Anna	,,	,,	-	1,350	
Jacob Kroll	,,	,,	—	1,4[illegible]	
Simon Margaretha	,,	,,		1,22[illegible]	
4 Lighters	,,	,,		-	

Wed. C. Boele & Son, Slikkerveer, bij Rotterdam.

Name of Vessel.	Built of	Owners	G.T. Regs.	G.T. inclu. erect.	I.H.P.
2 Lighters	Steel	Rosario		600ea	
Lighter	,,	Dordrecht		1,441	—
Lighter	,,	Duisburg	—	1,475	
Lighter	,,	Waspik		1,072	—
† Tug	,,	Mainz			175
† 3 Tugs	,,	Rouen	-		[illegible]00ea
† Tug	,,	Dunkerque	—	—	400
† Tug	,,	Duisburg	—		2[illegible]0

Bonn & Mees, Rotterdam.

Name of Vessel.	Built of	Owners	G.T. Regs.	G.T. inclu. erect.	I.H.P.
† Mendo	Steel	Rotterdam	[illegible]		2,40[illegible]
Canon	,,	,,	[illegible]	—	—
Benoa and Kalmeа	,,	Batavia	[illegible]ea	—	—

J. Drewes & Co., Ijzeren Scheepsbouw big Groningen.

Name of Vessel.	Built of	Owners	G.T. Regs.	G.T. inclu. erect.	I.H.P.
* Albatros (Steam Tug)	—	Hamburg	-	—	120
Gerzie I. and II.		Gerzie	—	300ea	—
Gerzie III. and IV.	-	,,		200ea	
† Wega (Steam Tug)	—	Bremen Nord-l Lloyd	—		32[illegible]

Jonker Gebr, Scheeps Baumeister, Kinderdijk.

Name of Vessel.	Built of	Owners	G.T. Regs.	G.T. inclu. erect.	I.H.P.
* No. 1 and Anna		Rotterdam		—	100ea
* Delphine		France			1[illegible]0
Adriana Cornelia		Dordrecht		700d.w.	
Adelheid	-	Germany		1,150 ,,	
Walhalla		,,		1,150 ,,	
Stella Maris		,,		1,[illegible] ,,	—
Twee Gezusters		Rotterdam		2[illegible] ,,	
* Heinrich		Germany			70

Koninklijke Nederlandsche Gropsneiderij, Leiden.

Name of Vessel.	Built of	Owners	G.T. Regs.	G.T. inclu. erect.	I.H.P.
* 2 Dredgers	-	Germany	2[illegible]ea		200ea
Barge Priestman		Argentine			
* Havenstoombootdienst X		Holland			[illegible]
2 Barges		Belgium			—
* Bruxelles XXXXI		,,			[illegible]
Ponton		Holland	-		—
* Uruguay VII.		Uruguay	2[illegible]		3[illegible]0
* Hollandia		Holland	[illegible]	-	200

Maatschappij voor Scheeps-en Werktuigbouw, "Fijenoord," Rotterdam.

Name of Vessel.	Built of	Owners	G.T. Regs.	G.T. inclu. erect.	I.H.P.
† Le Maire and Van Spilbergen (schooner)	Steel	Batavia	2,[illegible]ea	-	1,600ea
† De Haan and Reynersz	,,	,,	1,700ea	—	1,1[illegible]ea
† 4 Torpedo Boats	,,	Royal Dutch Navy	140dis ea	—	2,[illegible]ea
* No. 222 Lifeboat	,,	Hook of Holland	—		1[illegible]
† Albatros, In. Revenue Steamer	,,	Dutch Government	104dis		200
† Swaerdecroon	,,	Batavia	1,7[illegible]	-	1,10[illegible]

J. Meyers Shipbuilding Co., Zalt Bommel.

Name of Vessel.	Built of	Owners	G.T. Regs.	G.T. inclu. erect.	I.H.P.
† Correct	Steel	Hamburg	1,075	—	7[illegible]
No. 273	,,	Rotterdam		1,020d.w.	
Lighter	,,	Worth Germany	-	750 ,,	—
Lighter	,,	Rotterdam	—	[illegible]20 ,,	
K I. and K II. (Hopper Barges)	,,	Hamburg	-	4[illegible]0 ,,	—
Curt and Claus	,,	,,	—	600 ,,	—
Lighter	,,	Rotterdam	-	370 ,,	—
Lighter	,,	,,	—	1,750 ,,	—
* Ferryboat	,,	Z. Bommel	40	—	[illegible]2

Nederlandsche Scheepsbouw-Maatschappij, Amsterdam.

Name of Vessel.	Built of	Owners	G.T. Regs.	G.T. inclu. erect.	I.H.P.
† Suriname and Saramacca	Steel	Paramaribo	3,1[illegible]2ea	—	2,700ea
4 Vessels	,,	Amsterdam	51ea	—	—
† Czaar Peter	,,	Alkmaar	169	—	[illegible]0
† Prins van Oranje	,,	,,	166	—	[illegible]
† Van Hoorn	,,	Batavia	1,734	—	1,100
† Rumphius	,,	,,	2,[illegible]37	—	2,[illegible]00
Friesland and Groningen	,,	Balik Papan	1,200ea	—	—
† Pluto	,,	,,	—	—	650
† Koningin Wilhelmina	,,	Paramaribo	17[illegible]	-	330
† Oranje	,,	,,	100	—	250

A. J. Otto & Son, Krimpen a.d. Yssel.

Name of Vessel.	Built of	Owners	G.T. Regs.	G.T. inclu. erect.	I.H.P.
Elizabeth	Steel	Rotterdam	278	—	—
Baden III.	,,	Bremen	650	—	—
Elize	,,	Wurzburg	66[illegible]	-	—
Alida Johanna II.	,,	Dordrecht	1,01[illegible]	—	—
Anna Gertrud	,,	Homberg	1,350	—	—
Helene	,,	Alken	1,182	—	—
Liberaal	,,	Rotterdam	400	—	—
† Zinlen	,,	,,	—	—	330

* Compound. † Triple.

J. J. Pattje, & Son, Waterhuizen, nr. Groningen.

Name of Vessel.	Built of	Owners	G.T. Regs.	G.T. inclu. erect.	I.H.P.
Else II.	Steel	Germany		210d.w.	—
Yawl	,,	Westerham-[illegible]		130 ,,	—
Dankbaarheid	,,	Pekela		120 ,,	—
Heikina	,,	Wildervank	-	230 ,,	-
Arcturus	,,	Hamburg	-	150 ,,	-
Emma	,,	,,	—	130 ,,	-

J. & K. Smits, Scheepswerven, Kinderdijk.

Name of Vessel.	Built of	Owners	G.T. Regs.	G.T. inclu. erect.	I.H.P.
† Sliedrecht IV.	—	Sliedrecht	400		[illegible]
* Maasstroom	—	Lith	135	—	[illegible]
* Roode Zee	—	Rotterdam	[illegible]6	—	1,[illegible]
† Texel	—	Texel	160	—	300
* M.O.P. III. B.	—	Buenos-Ayres	24[illegible]	-	375
No. IV. (Sailing Barge)	—	Brielle	48	—	—
No. 608 (Sailing Barge)	—	,,	[illegible]	—	—

Firma A. F. Smulders, Schiedam.

Name of Vessel.	Built of	Owners	G.T. Regs.	G.T. inclu. erect.	I.H.P.
* Don Ricardo	—	Argentine	[illegible]	—	450
* Floating Crane	—	,,	1,000	-	750
* Floating Crane	—	,,	900	-	750
* Hopper Dredger	—	Italy	1,7[illegible]	-	900
* Suction Dredger	—	,,	450		200
* Bucket Dredger	—	Denmark	380		300
* Tug and Service Boat	—	Holland	1[illegible]		170
* Dredger	—	Argentine	[illegible]00		700

A. Vuijk & Zonen, Capelle a.d. Yssel.

Name of Vessel.	Built of	Owners	G.T. Regs.	G.T. inclu. erect.	I.H.P.
Elise	Steel	Lobith	375		
"O"	,,	Bremen	650	-	
Hercules	,,	Duisburg	120	—	
Mathilde	,,	Rotterdam	550	—	-
† President de Leeuw	,,	Antwerp	265		1,000
St. Michael	,,	Schiedam	1[illegible]2		—
Johanna	,,	Waspik	584		—
Alice	,,	Duisburg	590	-	—
† Anna Maersk	,,	Copenhagen	1,[illegible]0		550
Monte Frio	,,	Wintham	680	—	—
Rosa	,,	Dinteloord	500		-
Naval	,,	Calloo	[illegible]20	-	-
Carl Paul III.	,,	Rotterdam	65[illegible]	-	—
Muro	,,	Waspik	600	-	—
Caland	,,	Rotterdam	400	-	

Van Vliet & Co., Hardinxveld.

Name of Vessel.	Built of	Owners	G.T. Regs.	G.T. inclu. erect.	I.H.P.
Friesland	Steel	London	900		
2 Lighters, R.S.G., 15 and 17		Duisburg Rukrort	1,[illegible]ea		
Irma	,,	Namur	1,4[illegible]		
Theodor	,,	Duisburg Ruhrort	1,[illegible]		
Barge	,,	Ysselstein	1[illegible]		
Marie	,,	Waspik	1,000		
Barge	,,	Dusseldorf	40[illegible]		
Lighter	,,	Antwerp	1,500		

N. V. Werf, v/h Rijkee & Co., Rotterdam.

Name of Vessel.	Built of	Owners	G.T. Regs.	G.T. inclu. erect.	I.H.P.
† Ceres and Zuno	Steel	Amsterdam	-	1,7[illegible]ea	1,000ea
* Leeuwarden	,,	,,	—	[illegible]50	700

Werf Conrad, Ltd., Haarlem.

Name of Vessel.	Built of	Owners	G.T. Regs.	G.T. inclu. erect.	I.H.P.
† Brod	—	Sevilla	550	—	350
† Germania II.	—	East Asiatic Dredging Co.	450	—	450
* No. 384 (Dredger)	—	Tokio	200	—	150
* No. 385 (Suction Dredger)	—	,,	11[illegible]	—	225
† No. 386 (Tug)	-	Asuncion	110		300
No. 387 (Floating Crane)			210	-	—
* No. 388 (Dredger) and Nos. 389, 390, 391 Dump Hopper Barges	—	Varna and	230 / 95	-	130 / —
* No. 392 (Tug)	—	Bourgas	82	—	150
* Cadiz (Dredger)	—	Cadiz	250	—	200
* Nos. 395 and 396 (Dredgers)	—	Tougkah	300	—	155

LIST OF VESSELS ENGINED IN 1908.

Alblasserdamsche Engineering Works, Albasserdam.

Name of Vessel.	Builders.	I.H.P.	Press. lbs.
† Atlas (Tug)	Rijkee & Co.	430	180
† F. Kleijn II. and III. (Tugs)	Werf Baanhock	230ea	190ea
† Czar Peter (Passenger Steamer)	Nederl. Scheepsbouw, M.Y.	375	165
† Prins Van Orange (J.E.)	,, ,, ,,	375	165
† Prins Welhamna (Tug)	Theisfing & Co.	400	200
* Leeuwarden (2 Twin-Screw Pontoons)	Rijkee & Co.	7[illegible]ea	120ea
† St. Ursula (Tug)	Werf. Zeeland	[illegible]2[illegible]	200
* Saving Pontoon	Theisfing & Co.	150	120
,, ,,		30	120
† 3 Tugs	Wed. C. Boele & Zoon	350ea	190ea
† 3 Tugs	Theisfing & Co.	250ea	100ea
* Industrie	Wed. C. Boele & Zoon	320	120
† Hildevert	Jonker & Stans	250	180

Netherlands Engineering Co., Amsterdam.

Name of Vessel.	Builders.	I.H.P.	Press. lbs.
† Suriname	Nederl Scheepsb C. My.	2,800	180
† Saramacea	,, ,,	2,800	180
† Von Hoorn	,, ,,	1,200	150
† Ceres & Juno	Rykee Rotterdam	1000ea	160ea
† Rumphius (twin-screw boat)	Nederl. Scheepsb C., My.	2,900	180
† Oranje	,, ,, ,,	250	160
† Koningin Wilhelmina	,, ,, ,,	350	160

* Compound. † Triple.

Kinderdijk Engineering Works, Der Kinderdijk.

Name of Vessel.	Builders.	I.H.P.	Press. lbs.
† [illegible]	T. & K. Smit's Scheepswerven	500	180
[illegible]	,, ,, ,,	200	180
Roode Zee ..	,, ,, ,,	1,700	16[illegible]
[illegible] III B	,, ,, ,,	[illegible]60	120
Texel	,, ,, ,,	300	150

Lohnis & Co., Rotterdam.

* In[illegible]	A. Pannevis-Alten	[illegible]	120
* No. 34	Dredger re-engined ..	100	120
‡ Koning[illegible]	Ferry Boat re-engined	[illegible]	[illegible]
† Zu[illegible]	A. Otto & Zonen, Krimpen	[illegible]	[illegible]
* B[illegible]	Zan Smit C[illegible], Alblasserdam	[illegible]	120
* M[illegible]	T. & K. Smit, Krimpen	[illegible]	120
* Schalka	Boele & Pot, Bolnes	[illegible]	120

Stork Bros. & Co., Hengelo.

Tr[illegible]	Werf Conrad, Haarlem	[illegible]	16[illegible]
* Bucket Dredger	,, ,,	[illegible]	120
* Suction Dredger	,, ,,	22[illegible]	120
* Bucket Dredger	,, ,,	130	120
* Tugboat	,, ,,	150	200
* [illegible] Dredger	,, ,,	200	12[illegible]
† D[illegible] Bucket	,,	500	16[illegible]
* Dredger . .		[illegible]	1[illegible]
* Suction Dredger	,, ,,	1[illegible]0	120
* Tin-bucket Dredger		1[illegible]0	120
* ,, ,,	,,	11[illegible]	120
* Bucket Dredger	,,	350	165
* Suction Dredger	,, ,,	400	200
,, ,,	,, ,,	1[illegible]	200

Wilton's Engineering & Slipway Co., Rotterdam.

Bruxelles, 4	Hilton	600	19[illegible]
* Elevator, 3, 4, 5, 6, 7, 8	,,	250ea	150ea
* Slipway	,,	250	1[illegible]0
p Falo	,,	[illegible]	
* Benoa & K[illegible]		2[illegible]0ea	10[illegible]ea
† Fiat Voluntas, 12	Only engines and boilers	650	205
† Voorlooper	,,	200	120
† Risico III. ..	,, ,,	650	20[illegible]
† Combinatie, 4	Only engines	650	205
† Clara ..	Only engines and boilers	200	120
† Fiat Voluntas 2, and Risico	,, ,,	550ea	205ea
* Hamburg, Saturn and Lubeck	,,	112ea	1[illegible]0ea
* Adrienne Desiree	,, ,,	[illegible]0	1[illegible]0
† M[illegible]	Only boilers	250	100
* Nova Cura	,, ,, ...	150	1[illegible]0
Queen Wilhelmina	,, donkey boiler	—	120

GERMAN.

Actien-Gesellschaft Weser, Bremen.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
Westfalen	Steel	Wilhelmshaven	—	—	—
† Berlin	,,	Bremen	—	10,2[illegible]0ab	14,000
* Pontoon	,,	Bremerhaven	—	[illegible]0ab	2[illegible]0

Blohm & Voss, Hamburg.

† Cleveland	Steel	Hamburg		16,[illegible]00ab	[illegible],[illegible]00
4 Dock-Pontoons				—	17,000ab

Braderburgh Heinrich, Hamburg.

* Nos. 222-225, Launches	—	Hamburg	7ea	—	15ea
* Kohlenh[illegible]	—	,,	[illegible]0	—	175
Nos. 227-228, Barges ..	—	,,	50ea	—	—
* No. 2[illegible], Launches		,,	7ea	—	18ea
No. 2[illegible] Floating Crane		,,	[illegible]	—	—
* No. 2[illegible] Launch		,,	7	—	18
* Hamburg ..		,,	12	—	90
* [illegible]-Werke III		,,	50	—	30eff

Eiderwerft Actiengesellschaft, Toning.

[illegible]	Steel	Cuxhaven	—	2[illegible]ea	400ea
† Pet[illegible]	,,	Flensburg	—	2,[illegible]81	9[illegible]
† Ingegard L[illegible]	,,	Harburg	—	[illegible]	4[illegible]0
No. [illegible] Lighters	,,	Wilhelmshaven		20[illegible]ea	—
No. [illegible] Pontoon	—	Husum		35	
No. [illegible] Dredger	—	Kiel	—	4[illegible]0	—

Flensburger Schiffsbau, Gesellschaft.

† N[illegible] Steam	Steel	Hamburg	6,6[illegible]	—	[illegible],000
[illegible]	,,	,,	4,21[illegible]	—	2,200
† Adele[illegible]	,,	,,	4,[illegible]12		1,800
† Ilse M[illegible]	,,	,,	4,[illegible]07		1,800
† Helene [illegible]	,,	,,	4,[illegible]		1,800
† Je[illegible]	,,	,,	1,048		[illegible]0

T. G. Hitzler, Lauenberg (Elbe).

* [illegible], Steam Tug	Steel	—	—		12[illegible]
216, 217 and 2[illegible], L[illegible] ..	,,		—	21[illegible]	
m 21[illegible], Boat				—	1[illegible]
m 221, Boat	,,			—	[illegible]

R. Holtz, Harburg.

[illegible] Vessels	Stee[illegible]	[illegible]		114	[illegible]4
[illegible] ,,	W[illegible]	—	—	11	[illegible]
[illegible]	St[illegible]	—	—	34	10,eff
6 Lighters				[illegible]	
L[illegible]				4	—
	W[illegible]				
V[illegible]	Ste[illegible]	[illegible]		4	1
				25	[illegible]eff

* [illegible] † Triple. ‡ [illegible] q Quadruple. m Motor. p Petr.

Howaldtswerke, Kiel.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
* Oscar	Steel	Hamburg	—	26	70
* [illegible]	,,	Trieste	—	414	240
† Dronning Olga ..	,,	Copenhagen	—	2,518	950
Vulkan	,,	Kiel	—	—	—
† Halvet ..	,,	Stockholm	—	1,649	650
‡ Carahue	,,	Carahue	—	826	600
Pontoon	,,	Braunschweig	—	110	—
5 Pontoons ..	,,	,,	—	340ea	—
2 Floating Docks	,,	Wilhelmshaven	—	500ea	—
* Lowe	,,	Kiel	—	326	220
† Johanne	,,	Esbjerg	—	921	400
* 3 Vessels	,,	Kiel	—	22ea	50ea
* Fohr Amrum	,,	Wyk (Fohr)	—	219	240
† Pozsony and Brasso	,,	Fiume	—	410ea	450ea
Ernst	,,	Braila	—	115	300
* Normann	,,	Kiel	—	321	240
† Aegir	,,	,,	—	95	200
† Vila Velebita	,,	Buccari	—	263	300
502-508	,,	Dusseldorf	—	140ea	—

Henry Koch, Lubeck.

6 Barges	Steel	Hamburg	ab50ea	—	—
† John Fauber	,,	,,	2,458	—	1,300
† Anneliese	,,	Lubeck	774	—	350

J. W. Klawitter, Danzig.

* Graf Zedlitz	Steel	—	108	—	220
† Unterelbe	,,	—	163	—	345
* Hertha	,,	—	35	—	115
†† Arman	,,	—	162	—	362
Two Lighters	,,	—	85ab	—	—
Lighter	,,	—	23	—	—
* [illegible] ..	,,	—	335	—	400
Lighter	,,	—	135		
,,	,,	—	65	—	—

Fried. Krupp Aktiengesellschaft Germaniawerft, Kiel-Gaarden.

Germania	Steel	Kiel	192	—	
† Ypiranga	,,	Hamburg	7,987		4,500
† Drache	,,	Kiel	765	—	1,600
m U3 and 4	,,	Pola	240 dis ea	—	600e
† Posen	,,	Kiel	ab18,000	—	—

C. Luhring Schiffswerfts-u-Trokendock, Kirchammelwarden, Brak I.O.

* Kehrewieder, Gut Heil and Willkommen	Steel	Brake	140ea		100ea
Marie Lunnemann	,,	Harburg	215	—	

Jos. L. Meyer, Papenburg, a.d. Ems.

* Yard No. 225	Steel	—	126	—	250
* ,, 226-27	,,		62	—	155
* ,, 228	,,		60	—	100
* ,, 229	,,		21		75
* ,, 230	,,	—	60	—	175
† ,, 231	,,	—	98	—	160
* ,, 232	,,	—	27	—	60
* ,, 234	,,	—	62		155
,, P 59, Barge	,,	—	33	—	—
,, P 60-61, Barge	,,	—	19	—	—

Nuscke & Co., Stettin-Grabow.

O.R., 4-16	Steel	Stettin	2,040	—	—
† Praecis	,,	,,	742	—	450
* Grete	,,	,,	35		75
* Schwiminkrau	,,	,,	265	—	50
* Kormoran	,,	Swinemunde	75	—	150
109 ..	,,	Stettin	18	—	—
Proviantprahm	,,	Wilk.haven	130	—	—
Munitionsprahm	,,	,,	245	—	—
* Otto Ippen II	,,	Stettin	38	—	100
Leichter, 1-4 ..	,,	Guyaguil	200		—
† Nicolai	,,	Archangelek	309	—	300
Elevator	,,	Stettin	130	—	16

Oderwerke Aktiengesellschaft, Stettin.

* Bagger XI., Dredger	Steel	Stettin	152	—	140
† Georg, Tug	,,	,,	60	—	250
† Bagger XIV. & XV., Dredgers	,,	Hamburg	900ea	2 × 400	—800
* Saturn	,,	Flensburg	275	—	300
† Spes	,,	Stettin	1,128	—	650
* Anderson	,,	Kukerneese	71	—	160
† Venator, Tug	,,	Stettin	114	2 × 180	—360
† Baumwell	,,	Hamburg	960	—	600

Reiherstieg Schiffswerfte and Maschinenfabrik, Hamburg.

†† Roda (No. 423)	Steel	Hamburg		7,266	3,500
†† Heluan (No. 424)	,,	,,	—	7,250ab	3,600

Rickmers & Co., Bremerhaven.

† Zeike Rickmers ..	Steel	Bremerhaven	—	4,176	1,600
† Madeline Rickmers		,,		4,170	1,600
L'Avenir		Antwerp	—	2,738	—

Schiffswerfte und Maschinenfabrik (Vormals Janssen & Schmilinsky), A.G., Hamburg.

* Amanda	Steel	Hamburg	—	38	105
* Cornelie Wessels	,,	Emden	—	136	350
* Sao Miguel ..	,,	Rio Grande do Sul		50	135
* Gebr Wulff 4	,,	Hamburg		33	120
* Alexandra	,,	Flensburg		157	390
† Scharnhorn	,,	Hamburg		270	700
* Seelotse	,,	Cuxhaven	—	151	410
* Edgar	,,	Hamburg		19	60
* Wertfölisches Kohlenkartor III.	,,	,,	—	20	120
* Aquiles	,,	B. Ayres		96	280
* Titan	,,	,,		140	450

* Compound. † Triple. †† Twin Compound. m Motor.

Seebeck, A. G., Bremerhaven.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
* Hermann and Heinrich	—	Geestemunde	[illegible]	—	[illegible]
†† Proteus	—	Bremen	24	—	[illegible]
Fritz and Pyn	—	Geestemunde	2,700	—	[illegible]
† Rio Pardo	—	R. Janeiro	78	—	[illegible]
* Castor and Pollux	—	Geestemunde	214	—	[illegible]
2 Drydock doors	—	,,	—	400	—
1 Floating Crane	—	,,	—	450	—
† Gronlund	—	,,	2[illegible]		[illegible]
† Flusslodse	..	Bremerhaven	[illegible]		1[illegible]

H. C. Stulcken Sohn, Hamburg.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
* Simone	Steel	Marseille			1[illegible]
* Move	,,	Hamburg		[illegible]	[illegible]
* Jollenfuhrer IV		,,	—		110
* Lakalk	,,	Kongsmark	—	40	—
* Kosmos	,,	Hamburg	—	40	14[illegible]
* Mengel	Wood	Ax in Africa	—	[illegible]	[illegible]
* Wettern & Pluschan	Steel	Hamburg	-	1	1[illegible]

Vulcan & Co., Stettin.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
† V 1[illegible] to 160, Torpedoboats	Steel	Wilhelmshaven	[illegible]ea	[illegible]ea	10,[illegible] ea
T 161, Torpedoboat		,,	[illegible]	[illegible]	1[illegible]
† Rheinland	.	Kiel		11,[illegible]	20,000
q George Washington	.	Bremen	21,000	2[illegible]	2[illegible]
t T [illegible]	..	Stettin	[illegible]	70	130

J. H. N. Wichorst, Hamburg.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
† Bd. Blumenfeld III.	Steel	Hamburg	80		[illegible]
* Golondrina	,,	Valparaiso	24		[illegible]
* Gunther	,,	Hamburg	20		[illegible]
* Marineverwaltung XI	,,	,,	32		110
* Henry Otto	..	,,	[illegible]		[illegible]
* Herma		,,	[illegible]		[illegible]
2 Pontoons		,,	12[illegible]		-
Kohlenelevater		,,	1[illegible]		

Gebruder Sachsenberg, Rosslau, & Deutz.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
* Loreley		Dusseldorf	347		[illegible]
* Bagger		Stettin	403		270
† Deutschland & Preussen		Hamburg	[illegible]		[illegible]ea
* Bayern		Dresden	370		[illegible]
* Frederich II. Herzog von Anhalt		,,	370		[illegible]
* Kronprinz Georg von Sachsen		.	283		[illegible]
* Schlesien		,,	2[illegible]		450
† Furst Bulow		Havelburg	2[illegible]		[illegible]
‡ Bumba		Congo	[illegible]		[illegible]
[illegible], Floating Bath	—	Cologne	[illegible]		
† 600, Rhine Steam Tug		Duisburg	[illegible]		[illegible]
* Anna Catarina		Cochamba	2[illegible]		[illegible]
† Gross Berlin		Hamburg	2[illegible]		[illegible]
603, Floating Bath		Cologne			
† Saturn		Havelburg	295		600
* Hoffnung		Strassburg	2[illegible]		4[illegible]

LIST OF VESSELS ENGINED IN 1908.

North German Lloyd, Bremerhaven.

Name of Vessel.	Builders.	I.H.P.	Press. lbs.
t Prinz Friedrich Wilhelm	Joh. C. Tecklenborg's Schiffswerft, Geestemunde	13,500	220
q Derfflinger	F. Schichau, Danzig	6,000	220
t Lutzow	Actien Gesellschaft, Weser Bremen	6,000	220
q Giessen	Bremer Vulkan, Vegesack	[illegible],000	227
† Vega	Prewes in G[illegible]deon, Holland	3[illegible]0	170

DANISH.

Aktieselskabet Burmeister & Wains, Maskin-o.g. Skibsbyggeri, Copenhagen.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
† Samui	Steel	Copenhagen	2,[illegible]		1,150
† Washington	,,	,,	881	-	510
† Sverige	,,	,,	686		1,300
† Wegadesk	,,	Sandefjord	4,271		2,000
† Peking	,,	Gothenburg	3,500		1,800
† Christian IX.	,,	Korsør	1,503	—	1,850

H. V. Bull, Frederickskaun.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
Cito	Steel	Aarhus	60	74	—
D.F.D.S. 13 and 14, Lighters	,,	Copenhagen	267ea	278ea	—
Sip, Lighter	,,	,,	278	297	—
p "X"	,,	Triest	2[illegible]	31	75

Copenhagen Floating Dock & Shipworks, Ltd., Copenhagen.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
† Inger	Steel	Esbjerg	—	775	550
2 Barges		Bangkok		200	
† Mahidol		,,		760	400
* Tugboat		,,		7[illegible]ab	200
Barge		,,		300 ,,	
† Karla and Laura		Antwerpen		77[illegible]ea	550ea
Graadyle	,,	Esbjerg		7[illegible]ab	500

Elsinore Iron Shipbuilding and Engineering Co., Elsinore.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
† Skinfaxe	Steel	Copenhagen		1,544	[illegible]
* Tile				110	450
† Rimfaxe				1,052	450
† Greneu	..	Skagen		2[illegible]	300

J. A. Petersen, Marstal.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
S. L. Weber	Wood	Marstal	69	—	—

FINNISH

Engine and Bridge Building Co., Helsingfors.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
† Kurs	Steel	Helsingfors		100	200

*Compound. †Triple. ††Twin Compound. ‡High Pressure. qQuadruple. p Petrol. t Turbine.

Aktiebolaget Sandvikens Skeppsdockaoch Mekaniska Verkstad, Hel[illegible]fors.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
c Ustwjagt	Steel	[illegible]	—	[illegible]	7
* [illegible]		[illegible]	—	[illegible]	70
* Regina		[illegible]	—	[illegible]	13
* Custom House Decked Steam Boats		[illegible]	—		70
		[illegible]	—		[illegible]
		,,	—	35	
* Kathe	.	[illegible]		.	[illegible]
* Tuna	,,	[illegible]		[illegible]	[illegible]

SWEDISH.

Bergsunds Mek. Verkstads Aktiebolag, Stockholm.

Name of Vessel.	Built of	Owners.	G.T.	G.T. inclu. erect.	I.H.P.
* Ljusterö	Steel	Stockholm		1[illegible]	
* Ostana II.	.			[illegible]	140
* Astrea / Spica	1st class T. Boats				1,800
* Hjalparen, Tugboat					180

Eriksbergs Mek. Verkstad Aktiebolag, Goteborg.

Name of Vessel.	Built of	Owners.	G.T.	G.T. inclu. erect.	I.H.P.
* [illegible] Sc. Steamer	Steel	Goteborg	[illegible]	[illegible]	120ea
* Alert (Sc. Tug)	,,	Helsingor, Denmark	—	—	[illegible]
* Skargarden Sc. [illegible]		Hamburg-sund Sverige	4	[illegible]	1[illegible]

The Goteborgs Nya Verkstads Aktiebolag, Goteborg.

Name of Vessel.	Built of	Owners.	G.T.	G.T. inclu. erect.	I.H.P.
† s.s. Ernst (Schooner)	Steel	Goteborg		640	400
* s.s. Montanus ,,	,,	Helsingborg	—	200	200
† s.s. L. Kollberg ,,	,,	Halmstad		[illegible]	4[illegible]
† s.s. Godhem ,,	,,	Goteborg	.	[illegible]	[illegible]
m 2 boats			-		
* 2 1st-class Torpedo Boats		R. Swedish Navy		1,108 dis. ea	1,850ea

Helsingborgs Varfs Aktiebolag, Helsingborg.

Name of Vessel.	Built of	Owners.	G.T.	G.T. inclu. erect.	I.H.P.
* s.s. Atos	Steel	Helsingborg	[illegible]		4[illegible]
Secunda (Lighter)	,,	,,	163 net	—	

Kockums Mek. Verkstads Aktiebolag, Malmo.

Name of Vessel.	Built of	Owners.	G.T.	G.T. inclu. erect.	I.H.P.
* Eskilstuna III (1-mast)	Steel	Eskilstuna	—	17[illegible]	1[illegible]
† Ragnar (T.B. Destroyer)	,,	Swedish Navy			7,200

Lindholmens Verkstads Aktiebolag, Goteborg.

Name of Vessel.	Built of	Owners.	G.T.	G.T. inclu. erect.	I.H.P.
† Ingeborg (Schooner)	Steel	Gothenburg		1,1[illegible]	600
† Strangnas Express ,,	,,	Strangnas		[illegible]	600
† Ask	,,	Stockholm	-	1,[illegible]	[illegible]
† Embla	,,	,,		1[illegible]	500
† Sigurd ,,	,,	Swedish Navy	—	[illegible] dis	7,[illegible]

Lodose Wharf Co., Ltd., Lodose, Goteborg.

Name of Vessel.	Built of	Owners.	G.T.	G.T. inclu. erect.	I.H.P.
* Sita (Schooner)	Steel	Gothenburg	42		42[illegible]

Motala Nya Verkstads Aktiebolag, Motala.

Name of Vessel.	Built of	Owners.	G.T.	G.T. inclu. erect.	I.H.P.
† Steam Ferry Evlgia	Steel	Stockholm	-		1[illegible]
* Tug Billy	,,	Gothenburg			250

Oskarhamns Mek. Verkstads och Skeppsdockas Aktiebolag, Oskarshamn.

Name of Vessel.	Built of	Owners.	G.T.	G.T. inclu. erect.	I.H.P.
m Rapp	Steel	Stockholm		242	1[illegible]
m Snapp	,,	,,		234	13
m Nya Gusmeb	,,	Werkstack		4[illegible]	4[illegible]
* Thor	,,	Wisby		[illegible]	[illegible]
Mud Lighters 1 and 2	,,	Stockholm		57 ea	—

NORWEGIAN.

Akers Mek. Værksted, Christiania.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
† Fjell	Steel	Bergen		118	ab550
† Agnella	..	,,		140	,, 5[illegible]
† Ramna and Swona	.	Leith	—	107ea	,, 350ea
† Norddible	.	Thorshavn		106	,, [illegible]
† Selvik	..	,,	—	10[illegible]	,, 3[illegible]
† Mjo Hardur	,,	Esland		167	,, [illegible]
† Kronprins Olav	,,	Haugesund		1,1[illegible]	,, 820
† Sallen	,,	Bodo	-	351	350
† Dagland	,,	Christiania		1,141	,, 820
† Hercules	..	Sandefjord	.	152	,, 38[illegible]
† Samson	,,	..	—	150	,, 385
† Edda and Snom	,,	,,	—	128ea	380ea
† Bangsund	.	Namsos	—	ab110	,, 250
† Whaler	,,	Leith	—	ab107	,, 350
† Ferry Boat (Engines only)		—			400

Aktieselskabet Fredriksstad Mek. Værksted.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
† Ena	Steel	Kristiania	1,071	--	800
* Trip 6	,,	Fredrikstad	42		85
† Antung	,,	Tonsberg	1,474		1,100
† Bravo	.	Kristiania	1,512		1,100
† Framnäs	,,	Kristinehamn	1,048		800
† Rym	,,	Bergen	1,074		800
Floating Dock	.	Fr. Stad			—

Bergen's Mekaniska Værkstad A.B., Bergen.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
† Bridge	Steel	Porsgrund	—	1,[illegible]	660
† Spostad	..	Christiania	—	1,[illegible]	[illegible]
† Yolanda Di Giorgia	,,	Bergen	—	1,[illegible]	1,[illegible]
† Texas	..	Christiania	-	[illegible]	1,896
† Mascot	,,	,,	—	[illegible]	[illegible]
† Fli	,,	Haugesund	—	1,[illegible]	660
† 1 Set Engines only		—			300

Brens Mek. Værksted, Trondhjem.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
† Hildur	Steel	Halesund	—	106	18[illegible]
† Heilhorn	,,	Bronno	—	203ab	213

Christiansand Mechanical Works, Christiansand.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
* Hövding	Steel	Flor[illegible]	—	106	110
* Borgund	.	Aalesund	—	100	110
† Solskjel	.	Christiansand	—	2[illegible]	350
† Oster		Bergen	—	1[illegible]	350

* Compound. † Triple. c Single Cylinder. m Motor.

Fevigs Jernskibsbyggere, Fevig, Arendal.

Name of Vessel.	Built of	Owners	G.T. Regis.	G.T. inclu. erect.	I.H.P.
[illegible]	Steel	Tonsberg	—	2,[illegible]00	1,200
[illegible]	,,	Porsgrund	—	1,[illegible]84	1,200
† [illegible]	,,	Kristiania	—	4,000	1,700
† [illegible]los	,,	,,	—	60	200
† [illegible]ailway Ferry	,,	,,	—	[illegible]	400
† Castor	,,	Bergen	—	500	1,340

Framnæs Mek. Værkstad, Sandefjord.

* Huvik II.	Steel	Sandefjord	11	—	40
† Erling	,,	Edinburgh	121	—	300
† Ronas Hill	,,	Lerwick	121	—	30[illegible]
† Jason	,,	Bergen	295	—	500
* San Sebastian	,,	Christiania	206	—	[illegible]
† Frigg and Frey	,,	Sandefjord	128ea	—	300ea

Laxevaags Shipbuilding & Eng. Co., Bergen.

† France	Steel	Bergen	[illegible]7	1,141	6[illegible]0
† Ragna	,,	,,	1,554	1,716	800
† Leda	,,	Helsingfors	986	1,207	650
† Skjold	,,	Haugesund	799	1,124	650
† [illegible]	,,	Bergen	1,000ab	1,125ab	650

Nylands Værksted, Christiania.

† Scittos	Steel	Christiania	—	1,260	650
† Juan	,,	Flekkefjord	—	1,493	1,200
† Sobral	,,	Para Brazil	—	1,011	800
† Hjorleifur	,,	Iceland		117	280
† Jen Sigurdsson	,,	,,	—	110	280
† Carsten Bruun	,,	Leith	—	105	280
† Bob	,,	Christiania	—	678	450
† Skarphjedinn	,,	Iceland	—	120	280
† Funding	,,	Thorshavn	—	115	250
† Vadso	,,	Christiania	—	1,279	850
† Holland	,,	,,	—	52[illegible]	600
† Tromo	,,	Arendal	—	678ab	450
† Eclair	,,	Christiania	—	165	[illegible]
† Etoile	,,	,,	—	164	350

Porsgrund Mek. Værksted, Porsgrund.

* Thorgny	Steel	Arendal	—	734	520
* Notodden	,,	Skien	—	159	150
* Kul (Tugboat)	,,	,,	—	23	100
* Margaret	,,	Kristiania	—	719	350
* Engines for a tugboat	—	Porsgrund	—	—	100
* Union III	Steel	Skien	—	100	150
* Engines for a passenger Steamer	—	,,	—	—	100

Stavanger Stoberi & Dok, Stavanger.

† Eva	Steel	Haugesund	1,080		680ab
† Stavangeren	,,	Stavanger	1,002	—	900 ,,
† Bergen	,,	,,	450ab	—	650 ,,

Trondhjems Mek. Værksted, Drontheim.

† Tromso	Steel	Tromso	—	25[illegible]	240
† Orkla	,,	Thamshavn	—	251	620
† Odin	,,	Trondhjem	—	158	2[illegible]4
† Nidelven	,,	,,	—	1,262	900
† Nidaros	,,	,,	—	350	900

AUSTRIAN.

Austrian Lloyd, Trieste.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
† Graz, Praga, Bregenz, Bruenn and Leopolis (2-pole masts)	Steel	Trieste	—	3,904ea	[illegible],200ea
* Steam Dredger	,,	,,	—	—	120

Marco Martinolich, Lussinpiccolo.

† Szamos	Steel	Fiume	—	154	350
* Alessandro Moschini	,,	Venezia	—	310	560
Vettes	,,	Fiume		620	750
Frankopan and Quarnero	,,	Ponte (Veglia	—	170ea	410ea

Stabilimento Tecnico, Triestino, Trieste.

* Armoured River Guard Vessels		Roumanian Navy	680dis	—	1,800
m Man		Trieste	14 ,,	—	120B.H.P.
Steamer		,,	194	—	[illegible]
Steamer		Fiume	247	—	[illegible]
2 Steamers		,,	204ea		400ea
2 Steamers		Sebenico	226 ,,		[illegible]20 ,,
2 Steamers		Zara	154 ,,	—	[illegible] ,,

HUNGARIAN.

Danubius Shipbuilding and Eng. Co., Ltd., Budapest.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
[illegible]1 and 662	Steel	Budapest	41ea		
* Zw[illegible]		[illegible]	[illegible]		2[illegible]
S D G 56, 57, 58, [illegible] and [illegible]1	Steel	[illegible]	41ea		
[illegible] and 10[illegible]		[illegible]	[illegible]ea		

Erst Ku. K. priv. Donau Dampfschiffahrts Gesellschaft, Budapest.

* [illegible] Paddle-wheel Steamer for Passenger Service	Steel				800
[illegible] Barge				2[illegible]	
[illegible] Barges				[illegible]	

Lazarus Works, Fiume.

[illegible]	Steel	F[illegible]	[illegible]		[illegible]

* Compound. † Triple. m Motor.

ITALIAN.

Cantieri Navales di Muggiano, Spezia.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
†† America	Steel	Genoa	—	8,600ab	7,000

Amerigo Gori, Leghorn.

Assunta	Schooner	Wood	Leghorn	—	131	—
Renato	,,	,,	,,	—	162	—
Rosarina G. V.	,,	,,	,,	—	130	
Rosina	,,	,,	,,	—	101	
Argentina	,,	,,	,,	—	24[illegible]	

Sicilian Naval Dockyard, Palermo, Sicily.

Mongineerro	Steel	Genoa	—	5,162	2,000

Societa Esercizio Bacini, Genoa.

† Rosario	Steel	Rosario de Sante Fé	—	665	500
a Principessa Mafalda	,,	Genova	—	9,500	10,000

LIST OF VESSELS ENGINED IN 1908.

Vianello-Moro, Sartori & Co., Venice.

Name of Vessel.	Builders.	I.H.P.	Press. lbs.
* Pisogne	—	45	120
* Ambrogio		100	135
* Pavia	—	250	135

SPANISH.

Euskalduna Shipbuilding Co., Bilbao.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
† Ganekogorta-mendi	Steel	Bilbao	—	3,001	247N H.P.

RUSSIAN.

T. R. Eales & Son, St. Petersburg.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
* Admiral Makaroff		St Petersburg	60dis	—	100
m Fomouchka		,,	40dis	—	60effective
10 Rowing Boats, 20 to 40 ft. long	—	—	—	—	—

HONG-KONG.

W. S. Bailey & Co., Hong-Kong.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
Meefoo	Steel	Hong Kong	—	320	—
2 Barges	Wood	Canton	—	110	—
/ Yangtse	Teak	Shanghai	—	30	130
m Launch	,,	Canton	—	18	20B.H.P.
‡‡ Marion (Launch)	,,	,,	—	35	70
m Launch	,,	,,	—	73	100B.H.P.
m Oil Barge	,,	Hong Kong	—	80	70
‡‡ Hanping	Steel	Hankow	—	952	650
‡‡ Launch	Teak	Manila	—	12	30

The Kong-Hong and Whampoa Dock Co., Hong-Kong.

* Vacuum	Wood	Hong Kong	27	—	70
† Cyklop	Steel	Bangkok	135	—	220
† Chantaboon and Aynthia	,,	,,	443ea	—	385ea
* Egbert, Geory and Wheeler	,,	Manila	60ea	—	180ea
* Glacis	Wood	Hong Kong	23	—	60
* Dilly	,,	Macao	150	—	250
Lighter	Steel	Manila	66	—	—
† Kiang Ta and Kiang Chi	Composite	Canton	183ea	—	510ea
* Adele	Wood	Samarang	25	—	60

STRAITS SETTLEMENTS.

Riley, Hargreaves & Co., Ltd., Singapore.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
Neptune (Side Discharge Hopper)	Wood	Singapore	247	247	—
* Cyril (Launch)	,,	,,	25	30	80
* Hargreaves	,,	,,	10	10	35
† Speurder (Patrol Steamer)	Steel	Batavia	130	150	350
* Launch	Wood	Singapore	18	18	60

The Tanjong Pagar Dock Board, Singapore.

Taurus (Hopper Barge)	Wood	London		211	—
Leo & Orion (Hopper Barges)	Steel	,,		240ea	—
Lighter		Labuan	—	50	—
* Mc. Arthur	Wood	,,	—	40	140
* Sri Lenggang	,,	Billiton	—	115	210
5 Lighters	,,	Penang	—	220 total	
2 Barges	Steel	Singapore	—	240 ,,	—
* Eileen (Screw Tug)	,,	,,	—	18	50
* Scout (Screw Tug)	,,	Penang	—	45	150
Crane Pontoon	,,	Singapore	—	80	—
Crane Pontoon	,,	,,		[illegible]0	—
* Screw Launch	Wood	,,		40	140
* Screw Launch	,,	,,		18	50
* Screw Train Ferry Steamer	Steel	,,	—	164	300

* Compound. † Triple. †† Twin Compound. a Quadruple.
‡‡ Compound Surface Condensing. / Compound Non-Condensing.
m Motor.

AUSTRALIAN.

The Adelaide Steamship Co., Adelaide.

Name of Vessel	Built	Owners	G.T. Regis.	G.T. inclu. erect.	I.H.P.
† Paringa	—	Adelaide	1,203	1,309	19[illegible]

Morrison & Sinclaire, Balmain, N.S.W.

Name of Vessel	Built	Owners	G.T. Regis.	G.T. inclu. erect.	I.H.P.
m Bronzewing, yacht	—	Sydney			[illegible]

Morts Dock and Engineering Co., Ltd., Balmain, Sydney, N.S.W.

Name of Vessel	Built	Owners	G.T. Regis.	G.T. inclu. erect.	I.H.P.
† Burra-Bra	Steel	Sydney	44[illegible]	44[illegible]	[illegible]
* Snowflake (Boiler and Engines only)	—		—	—	1[illegible]
Our Elsie (Boilers and Engines only)	—	—			20[illegible]

AMERICAN.

W. Irving Adams & Son, East Boothbay, Maine.

Name of Vessel	Built of	Owners	G.T. Regis.	G.T. inclu. erect.	I.H.P.
† Islander	Wood	Bath	—		2[illegible]
* Tourist		Damariscotta	—		8[illegible]

The American Car and Foundry Co., Wilmington, Delaware.

Name of Vessel	Built of	Owners	G.T. Regis.	G.T. inclu. erect.	I.H.P.
3 Car Floats	Wood	New York	612ea		—
Dump Scow		Norfolk, Va	1,200	—	—
Ruth and City of Philadelphia (Barges)	—	Philadelphia	400ea	—	—
Harriet M. and Eleanor (Barges)	—	„	350ea	—	—
Dump Scow	—	Norfolk Va.	1,200	—	—
Bradley . . Lighter	—	New York	350	—	—

The Baker Yacht Basin Inc., Quincy, Mass.

Name of Vessel	Built of	Owners	G.T. Regis.	G.T. inclu. erect.	I.H.P.
g King Fisher		Boston	2[illegible]		17[illegible]
g Gannet	—	Philadelphia	10	—	30
g Carolle	—	New London	12	—	2[illegible]
g Lady Bee	—		10	—	2[illegible]
g Sarapa II.	—	Boston	—	—	[illegible]

F. S. Bowker & Son, Phippsburg, Maine.

Name of Vessel	Built of	Owners	G.T. Regis.	G.T. inclu. erect.	I.H.P.
Frank B. Witherbee, 3-Master	—	Boston	—	6[illegible]	

The Buffalo Dry Dock Co., Buffalo, New York.

Name of Vessel	Built of	Owners	G.T. Regis.	G.T. inclu. erect.	I.H.P.
† Americana	Steel	Buffalo, N.Y.	—	1,000	
Honduras		Duluth, Minn.	—	2,350	—

The Wm. Cramp & Sons' Ship and Engine Building Co., Philadelphia.

Name of Vessel	Built of	Owners	G.T. Regis.	G.T. inclu. erect.	I.H.P.
† South Carolina	Steel	U.S. Navy	16,000	—	16,500
† Mohawk (2-pole Masts)	„	New York	4,623	—	3,0[illegible]

M. M. Davis & Son, Solomons, Maryland,

Name of Vessel	Built of	Owners	G.T. Regis.	G.T. inclu. erect.	I.H.P.
c Mary Reitel	Wood	Balto	46	—	100
c Estlen Philips	„	„	46	—	100
† Gadabout	„	„	20	—	75

G. G. Deering Company, Bath, Maine.

Name of Vessel	Built of	Owners	G.T. Regis.	G.T. inclu. erect.	I.H.P.
William R. Wilson, (4-mast Schooner)	—	Bath	1,385	—	—

The Detroit Shipbuilding Co., Detroit, Michigan.

Name of Vessel	Built of	Owners	G.T. Regis.	G.T. inclu. erect.	I.H.P.
† Wainwright	—	Erie, Penn.	4,137	—	1,650
† A. E. Nettleton	—	Oswego N.Y.	6,256	—	1,800

The Fore River Shipbuilding Co., Quincy, Mass.

Name of Vessel	Built of	Owners	G.T. Regis.	G.T. inclu. erect.	I.H.P.
t North Dakota, U.S. Battleship	—	U.S. Govt.	20,000 dis.	—	25,000
8 Artillery Tugs		—	—	—	—
3 Cartfloats	Steel	New London Conn.	—	—	—

W. A. Fletcher & Co., North River Ironworks, Hoboken, New York.

Name of Vessel	Built of	Owners	G.T. Regis.	G.T. inclu. erect.	I.H.P.
b Robert Fulton . Paddle	—	New York		—	4,000
b Trojan	„	Albany, N.Y.			2,[illegible]
b Duplicate of Trojan	„	„			[illegible]
b Princeton	„	„		—	[illegible]

The Gildersleeves Shipyard, Gildersleeve, Conn.

Name of Vessel	Built of	Owners	G.T. Regis.	G.T. inclu. erect.	I.H.P.
A. E. Mitchell, Coal Barge	Wood	New York	—	575	—
Jack . . Deck Lighter	„	Hartford	—	342	—
Robert, J. „	„	New York	—	307	—
John Hall „	„	Hartford	—	339	—
Howard „	„	„	—	340	—
Oscar „	„	„	—	336	—
G. K. Mellen . . Coal Barge	„	„	—	462	—
James H. Scully „	„	Perth Amboy	—	608	—
Frank P. Scully „	„	„	—	611	—
Louis „	„	Hartford	—	461	—
Stewart „	„	„	—	459	—
Joel „	„	„	—	50[illegible]	—

The Great Lakes Engineering Co., Detroit, Mich.

Name of Vessel	Built of	Owners	G.T. Regis.	G.T. inclu. erect.	I.H.P.
a Burlington Packing Freight		Buffalo	2,285	—	1,[illegible]00
† M. A. Bradley, Bulk Freighter		Cleveland	5,530	—	1,420
† Normania „		Ashtabula	4,571	—	1,350
† Harry A. Berwind „		Duluth	6,624	—	1,850
† William Livingstone „		„	6,624	—	1,850
† James Corrigan „		N. Tonawanda	6,971	—	1,7[illegible]
† Daniel B. Meacham „		„	6,971	—	1,7[illegible]
† Adam E. Cornelius „		Buffalo	4,900	—	1,380
† Wyandotte „		Wyandotte Mich.	2,09[illegible]	—	1,030
Ecorse, Tug		Ecorse Mich.	52	—	200

Harlan & Hollingsworth Corporation, Wilmington, Delaware, U.S.A.

Name of Vessel	Built of	Owners	G.T. Regis.	G.T. inclu. erect.	I.H.P.
Floating Grain Elevator, 2	Steel	Not registered Philadelphia	632	632	—
c 4 Harbour Lighters	„	New York	500ea	467ea	400ea

* Compound. † Triple. a Quadruple. b Beam Engine. c Single Cylinder. g Compound Diagonal. t Turbine.

George Lawley & Sons Corporation, South Boston, Mass.

Name of Vessel	Built	Owners	G.T. Regis	G.T. inclu. erect	I.H.P.
† Visitor II., Aux. 3-masted	—	New York	—	—	7[illegible]
Shearwater II., Sloop	—	Boston		—	
m Lul-Zar		„		—	2[illegible]
m Nameless		Beverly			2[illegible]
m Viator and Shada		Boston			100ea
m Christina		„			200

The Maryland Steel Co., Sparrows Point, Maryland.

Name of Vessel	Built	Owners	G.T. Regis	G.T. inclu. erect	I.H.P.
4 Vessels	Steel	Isthmus of Panama	200ea		
Raritan and Navesink	„	New York	3,000ea		[illegible]
Vessels	„	Isthmus of Panama	150ea		
Morgan	„	Savannah	200	—	
* P.R.R. No. 1[illegible]4	„	New York	4[illegible]		[illegible]
††Galveston	„	Galveston	[illegible],700		2,000
Chester	„	Cuba	240		

The Moran Co., Seattle, Washington.

Name of Vessel	Built	Owners	G.T. Regis	G.T. inclu. erect	I.H.P.
† Stanley Dollar	Steel	San Francisco		1,[illegible]	[illegible]
† Northland	„	Ketchikan, Alaska		71	[illegible]
† Ajax	„	San Francisco		[illegible]	[illegible]00
† Falcon	„	Portland, Maine	—	1,838	850
† Riverside	„	San Francisco	—	1,[illegible]	850

The Nelson Yacht Building Co., Baltimore, Maryland.

Name of Vessel	Built	Owners	G.T. Regis	G.T. inclu. erect	I.H.P.
m No. 119	Wood	Balto	—	—	[illegible]0
m No. 130	„	„			30
m Constance	„	New Orleans		—	1[illegible]

Newport News Shipbuilding and Dry Dock Co., Newport News, Virginia.

Name of Vessel	Built	Owners	G.T. Regis	G.T. inclu. erect	I.H.P.
† Pass. Steamer Lurline	Steel	San Francisco	6,200		[illegible]
† Oil Tank Steamer Texas	„	Port Arthur, Tex.	[illegible],000	—	2,800
* Tugs, Corning and Bath	„	New York	180ea		600ea
† Rev. Cutter Seneca	„	U.S. Rev. Cutter	1,500		1,500
* Dredge Clatsop	„	U.S. Army Engineers	1,000	—	900
† Rev. Cutter Acushnet	„	U.S.R.C. Service	1,000	—	1,000
† Pass. Steamer Southland	„	Washington	2,000	—	3,000
† Cable-Layer Jos. Henry	„	U.S. War Dept.	790	—	1,000
12 Steel Dump Barges	„	Panama Canal	875 disp. ea		
6 Steel Dump Barges	„	„	900	„	

The New York Shipbuilding Co., Camden, N.J.

Name of Vessel	Built	Owners	G.T. Regis	G.T. inclu. erect	I.H.P.
† Oklahoma (Oil Tanker)	Steel	Port Arthur, Tex.	5,553	—	[illegible],200
† Michigan	„	U.S. Navy	16,000	—	16,500
† 8 vessels, L. H. Tenders	„	L.H. Dept.	567ea dis.		1,100ea
† 2 Revenue Cutters	„	U.S. Treasury Dept.	960 dis. ea		1,400ea
2 Car Floats		—			

The Pittsburg Steamship Co., Cleveland.

Name of Vessel	Built	Owners	G.T. Regis	G.T. inclu. erect	I.H.P.
‡ Wm. A. McGonagh, Fire Tug	Steel	Duluth	—	—	1,000

Jas. Rees & Sons Co., Pittsburg, Pennsylvania.

Name of Vessel	Built	Owners	G.T. Regis	G.T. inclu. erect	I.H.P.
* Stm. B. F. Jones	—	Pittsburg	140	—	450
* Nile	—	Kartoume	150	—	300

Arthur D. Story, Essex, Mass.

Name of Vessel	Built	Owners	G.T. Regis	G.T. inclu. erect	I.H.P.
Rex, Schooner	—	Gloucester	137	—	—
Libbie, Aux. Yawl	—	New York	—	—	—
Victor Ethan, Schooner	—	Boston	95	—	—
Julia Daris „	—	Greenport, N.Y.	50	—	—
Leo „	—	Boston	45	—	—
Josie and Phebe „	—	„	137	—	—

The Superior Shipbuilding Co., West Superior, Wisconsin.

Name of Vessel	Built	Owners	G.T. Regis	G.T. inclu. erect	I.H.P.
† Rufus P. Ramsey	Steel	Fairport	4,797	—	1,200
† J. F. Durston	„	Oswego	4,791	—	1,200

Joseph Supple, Portland, Oregon.

Name of Vessel	Built	Owners	G.T. Regis	G.T. inclu. erect	I.H.P.
c Mascot, River Boat	—	Portland Oregon	—	450	400
c Tasmina „ „		Katalla, Alaska	—	225	200
J. W. Jacobs		Fairbanks, Alaska	—	250	225

The Toledo Shipbuilding Co., Toledo, Ohio.

Name of Vessel	Built	Owners	G.T. Regis	G.T. inclu. erect	I.H.P.
a Fred G. Hartwell	Steel	Duluth	—	6,223	2,000
† Wauketa	„	Detroit		—	1,000

The Union Iron Works, San Francisco, California.

Name of Vessel	Built	Owners	G.T. Regis	G.T. inclu. erect	I.H.P.
* 3 U.S. Army Tugs	Wood	San Francisco	—	[illegible] 25ea	100ea

The United States Navy Yard, Marne Island, California.

Name of Vessel	Built	Owners	G.T. Regis	G.T. inclu. erect	I.H.P.
† U.S.S. Prometheus	Steel	American	12,500 dis.		—
10 Coal Barges	Wood	—	2[illegible]ea	—	
6 „ „	„	—	75ea	—	

By The United States Navy Yard, New York.

Name of Vessel	Built	Owners	G.T. Regis	G.T. inclu. erect	I.H.P.
† Fleet Collier Vestal	Steel	U.S.	—	—	7,500

The Southern Pacific Railway, Oakland.

Name of Vessel	Built	Owners	G.T. Regis	G.T. inclu. erect	I.H.P.
* Melrose, wooden side wheel ferry steamer		San Fran	—	—	1,000
* Navajo wooden stern wheel river steamer		„	—	—	—

* Compound. † Triple. †† Twin Compound. ‡ High Pressure. a Quadruple. c Single Cylinder. m Motor.

CANADIAN.

Joseph McGill, Shelbourne, N.S., Canada.

[illegible]	Schooner	Wood	Shelbourne, N.S.		[illegible]	
[illegible]	..	..	Yarmouth, N.S.	—	[illegible]	
[illegible]			Charlottetown P.E.I.			
[illegible]	Schooner	..	Barrington N.S.	—	[illegible]	
[illegible] J. Lutz	..	..	Digby N.S.	—		
[illegible] Hugh D.		..	Yarmouth N.S.	—	—	—
Argenta	Schooner	..	Lunenburg N.S.	—	[illegible]	—

Wagner, Chester, N.S.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
Goldie Bell Schooner	Wood	Lunenburg		[illegible]	

G. M. Cochrane, Fox River. N.S.

Conrad S (Schooner) ..	Wood	Parrsboro	[illegible]		
[illegible]	..		[illegible]		
Schooner	..		2[illegible]3		

JAPANESE.

The Imperial Dockyard, Maizurn.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
[illegible]	Steel	—	—	—	6,000
Isonami	..	—	—	—	6,000

The Mitsu Bishi Dockyard and Engine Works, Nagasaki.

Sakura-Maru	Steel	Tokyo	—	[illegible]	[illegible]
† Hirano-Maru	..	..	—	[illegible]	7,000
† Atsuta-Maru	..	..	—	[illegible]	7,000
t H.I.J.M.S. Mogami (Despatch Boat)		—	—		—

Ono's Shipbuilding Yard, Osaka.

* Ono Maru, 2-masted Schooner	Steel	Osaka	—	438	270
t Hitaka Maru, ..	..	Hakodate	—	19[illegible]	200
[illegible] Uwajima Maru, 1-masted Sloop	..	Yawata Iyo	—	500ab	400

Osaka Iron Works, Osaka.

† Eunin Maru	Steel	Osaka	1,[illegible]94	1,811	1,200
† No. [illegible] Seishi-Maru		..	493	7[illegible]6	540
† No. 2 Hankaku-Maru		Tokyo	[illegible]	864	802
* Chuyo-Maru		Osaka	46	86	184
* Tonan-Maru (Dredger)		..	106	196	196
* Shirataka-Maru		—	—	—	161
* Tamahime-Maru		—	—	—	140
* Takasago-Maru		—	—	—	408
4 Pontoons		—	—	—	—
2 Dredgers		—	—	—	—
3 Barges		—	—	—	—
† Danchi-Maru (Trawler)		—	—	—	—

CHINESE.

The New Engineering and Shipbuilding Works, Ltd., Shanghai.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
* Soon Irift	Steel	Shanghai	44	—	100
* Li-Min	Teak	..	31	—	90
* Kh[illegible], Leen and No. 147 ..	Steel	..	[illegible]ea	—	100ea
* No. 146	Teak	..	43	—	75
m 1 Vessel (Lighter)	..	..	60	—	40
[illegible] Pontoons	Steel	..	105	—	—
m 1 Launch	Teak	..	2	—	[illegible]

The Shanghai Dock and Engineering Co., Ltd., Shanghai.

* Chthia X	Steel	Shanghai	93	—	170
† Wan[illegible]		..	158	—	885
4 Lighters	..	..	100ea	—	—
2 Barges		..	400ea	—	—
Lorchas	..	..	120ea	—	—
Lorchas	..	..	210ea	—	—

INDIAN.

Burns & Co., Ltd., Howrah, Bengal.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
Passenger Barge	—	Calcutta	18	—	—
m Launch	—	—	1	—	6
[illegible] Cargo Barges	—	—	total 256	—	—
[illegible] Jute Barges	—	—	.. 720	—	—
* Surprise	—	Madras	18	—	60
Composite Barge	—		21	—	—
[illegible] Barge			[illegible]	—	—
Lime Barge			[illegible]		—
* [illegible]		Calcutta	[illegible]		1[illegible]7
* [illegible] and Pegu		Rangoon	[illegible]		1[illegible]
[illegible] (reconstructed)		Calcutta	[illegible]		
* [illegible]		—	100		260
Launch			1	—	[illegible]
[illegible]	—	—	6	—	—

† Triple. * Compound. *m* Motor. *t* Turbine.

WORK COMPLETED DURING THE YEAR.

— —

ENGLISH.

Sir W. G. Armstrong, Whitworth & Co., Ltd.—Particulars of various classes of vessels built at Walker and Elswick Shipyards from 1882 to 1908.

	No.	Tonnage.	I.H.P.
War vessels ..	119	310,237	741,955
Passenger and Cargo Steamers ..	420	649,563	385,951
Petroleum Steamers	91	278,775	140,726
Icebreakers, Dredgers, etc.	83	51,038	39,220
Paddle Steamers ..	93	24,840	20,556
Totals ..	809	1,314,453	1,337,405
Totals for last seven years		361,367	380,180
Average per annum ..		51,624	54,311
Maximum in one year, *viz.*, 1907		74,228	63,700

The Blyth Shipbuilding and Dry Docks Co., Ltd., in addition to being shipbuilders, are repairers of hulls and machinery, and in this department have during the year carried out some extensive repair jobs and alterations Their five graving docks and ample facilities enable them to do work very expeditiously

The Northumberland Shipbuilding Co., Ltd., Howdon-on-Tyne.—Included in the vessels launched are two fine large deadweight carrying steamers for the Wilson Line to run in their Atlantic trade. There is also included a beautiful steamer which is the first steamer built for the National Steam Navigation Co., Ltd., of Greece, a company which has been promoted by the well-known firms of Embiricos Bros., of Syra, and A. A. Embiricos and Co., of London. The vessel is intended to encourage and promote the large passenger, emigrant and goods traffic now carried on between Greece and United States, and will have luxurious accommodation for about sixty first-class passengers, and will carry 1200 to 1300 emigrants. She will have twin-screw engines, and is designed to attain a speed of at least 16 knots. The returns show a large decrease compared with the previous year, but this is chiefly accounted for by the disputes with shipbuilding and engineering trades, which have prevented orders and consequently restricted the output of the district. This yard is now well employed, and the tonnage next year will be considerably increased.

Messrs. John Readhead & Sons, South Shields, have, in addition to vessels launched, done a fair amount of work in their graving dock department.

Tyne Iron Shipbuilding Co., Ltd., Willington Quay-on-Tyne.—The notable feature about the output of this firm is that the bulk of the tonnage consists of two large modern oil tank steamers, the *Petroleine* and *Clearfield*, for which class of vessel this firm have a very high reputation. On the trial trip of the *Petroleine*, when two-thirds loaded, an average speed of over 11½ knots was attained, and the vessel herself is fitted with an exceedingly elaborate oil installation capable of dealing with three separate and distinct kinds of oil at one and the same time. The *Clearfield* is the seventh oil steamer which has been built by this firm during the last fourteen years.

S. P. Austin & Son, Ltd., Sunderland, had a fairly busy year in their repairing business; the tonnage docked on their pontoon and in the graving docks has amounted to 275,000 tons gross register, in addition to which work has been carried on at their repairing quays, including repairs and alterations of steamers' hulls, reboilering and repairs to machinery.

Osbourne, Graham & Co., Sunderland.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
Kutangata (reconstructed)		London	1,982	2,072	1,200

Sir Raylton Dixon & Co., Ltd., Middlesbrough-on-Tees. In addition to vessels launched, a large amount of repairing work has been done, and of the 26,146 tons nearly 11,000 are of the patent cantilever type, the *Konarky*, *Queensgarth* and *Fiona*, being Patent Cantilever framed top-side tank steamers.

Goole Shipbuilding and Repairing Co., Ltd., Goole.—In addition to vessels launched, the firm have done a large amount of repair work to both hulls and engines of steamers.

J. Scarr & Son, Beverley and Howden, Yorks.—Repaired twenty-five vessels during the year and built the largest lighter in the district.

Forrestt & Co., Ltd., Wyvenhoe.—In addition to vessels launched, the repairing docks have been kept well occupied during the year, a large number of steam yachts, War Department steamers, etc., being overhauled by the firm.

H. R. Stevens, Ltd., Southampton.—Number of small boats amounting altogether to 50 tons.

Cox & Co., Falmouth, have built and fitted new boilers and machinery to various other vessels, besides sundry other work and repairs.

Garston Graving Dock and Shipbuilding Co., Ltd., Garston, Liverpool, have not launched any vessels during the year, but at present they have in hand an iron light vessel for the Corporation of Trinity House. Their Grayson's Dry Dock has been kept fairly occupied during the year with repairs to bottom damages, overhauling of machinery, painting hulls of a great number of the coasters using this port, and notably extensive repairs to the dredger "Cornwall" and steamers "Taunton" and "Torrington"; they have also carried out extensive repairs and alterations to the steamer late "Countess of Lisburne," to fit her for service in the Brazilian river trade. Large repairs have been carried out to the steamer "Ratcliff," together with structural alterations. A great number of vessels have been dealt with in the Garston Wet Docks with deck and engine repairs. They have also constructed several large funnels for the steamers using the Liverpool Docks, and tanks are a special feature of the business.

Vickers, Sons & Maxim, Barrow-in-Furness.—The tonnage launched is low, because two large warships upon which work has been proceeding in 1908 will not be launched until the beginning of 1909.

ENGLISH ENGINES.

Blair & Co., Ltd., Stockton-on-Tees.—In addition to vessels engined, fifteen new boilers have been built for other engine builders, trawlers and donkey boiler purposes, having an aggregate H.P. of 6425. Total I.H.P. for the year, 30,600.

Central Marine Engine Works, West Hartlepool.—In the boiler department a large number of boilers have been made, amongst them being boilers for the Crown Agents for the Colonies. A large quantity of engine castings has also been made for [illegible] and others. The forge, notwithstanding the engineers' strike, and the severe depression in shipbuilding, has been kept busy with new stern and rudder frames, tail end shafts, etc. The drop forging plant has been actively employed, and numerous additions have been made in the already large stock of dies. Two diplomas of honour were obtained at the Franco-British Exhibition for the high-grade donkey boiler, evaporator and drop forgings exhibited.

R. & W. Hawthorn, Leslie & Co., Ltd., Hebburn-on-Tyne.—The vessels engined, with the exception of the *Nippon*, have all been engined and boilered by this firm at their St. Peter's Works.

North-Eastern Marine Engineering Co., —Of the above total output 46,160 I.H.P. was constructed at the Wallsend Works, and 24,920 at Sunderland Works. Summary of output—1904, 105,385 I.H.P.; 1905, [illegible] I.H.P.; [illegible] I.H.P.; [illegible] I.H.P.; [illegible] 71,080 I.H.P. Total, 528,044. Average for five years, 105,609 I.H.P.

Wallsend Slipway & Engineering Co., Ltd., Wallsend-on-Tyne. — In addition to vessels engined they have fitted vessels with new boilers representing a total I.H.P. of 10,255, and have also fitted eight vessels with oil burning installations.

Earles, S. & E. Co., Ltd., Hull.—I.H.P. of machinery for renewals and vessels built elsewhere [illegible] I.H.P.

Toope's Asbestos Covering Co., Ltd., inform as that in spite of increased competition their trade is enlarging each year. Amongst their more important works completed they mention several large steamships both in London and the North, upon which they have fitted their patent mattresses and their patent infusorial asbestos composition, also large oil works in Erith, City of Westminster Corporation, Mile End Workhouse and Infirmary, Mann Crossman & Paulins, and City of London Breweries, Messrs. Hardman & Holden, large chemical works in the North, and several large and small private companies. They have also established agenices in Montreal, Canada, and Bombay, India and Amsterdam, Holland.

United States Metallic Packing Co., Ltd., Soho Works, Bradford, have fitted their metallic packings to the following vessels:—H.M.S. Teviot, H.M.Y. Victoria and Albert, H.M.S.'s Welland, Crescent, Antrim, Petroleum Russell, Drake, Kharki, Lord Nelson, Shannon, Agamemnon, Minateur, Defence, H.M. tug Rambler, H.M. Storeship Industry, ss.'s Pericles, Paringa, Koombana, City of Naples, Julian Alonso, Chesapeake, Cheyenne, Purelight, Saranac, Columbia, Elysia, Bavaria, Lightning, Ranee, Shah Jehan and Pundit. Four new steamers; s.s. Baron Gautsch; Austrian Lloyd Arsenal, new steamer; Australind Steam Shipping Co., ss.'s Bedouin, Bellambi, Hermione, Netravati, San Paulo, Minas Geraes; ss.'s Hero, Redbreast, Anemone, Princess Charlotte, Bellaventure and Bonaventure; T.S. bucket ladder dredger Kuantan; ss.'s Ultonia, Pannonia, Afrique; new steamer for Jacob Christensen; ss. Craster Hall, s.y. Sagitta; ss.'s Nigeria, Akabo, Leopoldville and new steamer, Elder, Dempster & Co. Ltd.; ss.'s Nicoya, and Chirripo, Cazengo and Dondo; s.y. Nerissa; s.t. boat Cartmel; ss.'s Coruna, Winchester, Virginia; dredger Mawhera; ss.'s Harford, Centurion and Merchant, Bhamo, Whitgift, Honorius Hermione, Hesperides, Rotterdam Karuah, Marimbula, Melissa, Osmanieh, Rathmore, Spen, Ambaca, Loanda, Portugal, Vassari, Paul Paix, Borborema, Waratah, El Lobo; dredger Longshoot; ss.'s Manchester Miller, Kooyong; dredger Leviathan; ss. Kapunda; dredger Hessam; t.b.'s Bartlett and Kinmount; ss. Rosaleen; new steamer Michael Murphy; ss.'s Lambare and Guarany; new steamer, New Zealand Steam Shipping Co., Ltd.; ss.'s Lombok, Ternati, Medan, Sanctoria, Otway, Orsova; five new steamers, Orient Steam Navigation Co.; ss. City of Brussels; dredger Doctor Saboia; sy. Iolanda; ss.'s Crown of Castille, Hamilton, Holmeside, George Pyman, Dunholme, Sandsend, Grangemouth; s.y. Cassandra; ss. Queensgarth; ps.'s Chitrali, Shimwari, Kapuli; ss.'s Oratava, Oroya, Sabor, Flintshire, Severn, Romanby, Hartlepool, Gadsby, Daleby, Barlby, Lackenby, Slingsby, Glenby and Ashby, Hercules, E. Hayward, Sargasso; elevator Leitrim; t.s.y. Triard; ss. Ipoh, new steamer Straits Steamship Co; ss.'s Blackrock, Redbridge; tender, Darenth; steam launch, Ravensbourne; ss.'s Cariboo, Volturno; three new steamers, W. Watkins; ss.'s Laurentic, Mourino, Kolpino, Tosno and Hull.

SCOTCH.

Hawthorns, & Co. Ltd., Leith.—The following steam drifters have been fitted by them with engines, boilers and deck castings:—Assistant, Janet Reekie, Slains Castle, Christina Mayes, 250 H.P. each. They have also carried out a considerable number of extensive repairs and overhauls. Amongst others, they have supplied a set of marine boilers, three in all, for the ss. Rona, belonging to Messrs. James Currie & Co., Leith. A large amount of colliery repair work has also been carried out by this firm during the year, including a set of mine pumps, capable of discharging 1000 gallons per minute against a 900 ft. head, a set of underground haulage gear, etc. Throughout the year work has been generally quiet both at their Leith and Granton establishments.

The Dundee Shipbuilding Co., Ltd., Dundee, Tay.—A considerable amount of repairs to hulls, and machinery, etc.

Hall, Russell & Co., Ltd., Aberdeen.—All the engines and boilers of the vessels launched have been constructed by Messrs. Hall, Russell & Co., Ltd.

ENGINES.

John G. Kincaid & Co., Ltd., Greenock.—Output in 1907, 22,750 I.H.P.; 1908, 12,850 I.H.P.; decrease in 1908, 9,900 I.H.P. In addition to vessels engined the firm have been well employed with the construction of boilers for export, and in the execution of repairs to vessels visiting this port.

IRISH.

MacColl & Co., Ltd., Abercorn Basin, Belfast.

† T.S.S. Cariboo, now Cowichan	Vancouver B.C.	[illegible] I.H.P.

DUTCH.

Arnhhem & Co., Arnhem.

† Three tugs built at the yards of Messrs. Boot Bros. Liederdorp		Engine No. [illegible]	200
		Engine No. [illegible]	450
		Engine No. 202	200
† Noordkaap excis. tug	Amsterdam	Engine No. 207	360

W. F. Stoel & Zoon, Alkmaar.—11 steel motor boats and four small boats.

† Triple.

GRECIAN.

Ateliers & Chantiers Hellenique Basiliades, Piraeus.—Repairs of damaged steamers, etc.

AMERICAN.

Skinner's Shipbuilding and Dry Dock Co., Baltimore City.—Two open and two covered Lighters, with an [illegible] aggregate to [illegible] tons.

STRAITS SETTLEMENTS.

Singapore Slipway and Engineering Co., Ltd., Singapore.—*One Teakwood Steam Launch, Bat, 54 ft. by 10·5 ft. by 6·5 ft. moulded, 65 I.H.P. *One Teakwood Steam Launch, Jess, 51 ft. by 10·5 ft. by 6·5 ft. moulded, 65 I.H.P. Sixteen Teakwood Cargo Lighters [illegible] ft. by 17 ft. [illegible] capacity 60-70 tons.

WORK ON HAND IN BRITISH YARDS.

ENGLISH.

Goole Shipbuilding and Repairing Co., Goole.—Cable Repairing Steamer and a Pontoon.

J. Scarr & Son, Beverley and Howden, Yorks.—Have orders in for the coming year, and very good prospects of further work; also at the Howden Yard they have vessels in construction, and plenty of work for the coming year.

W. H. Warren, New Holland.—Sea-going Lighter, fitted up to sail, and lengthening a Steam Trawler.

H.M. Dockyard, Portsmouth.—" Bellerophon " and " St. Vincent " completing; " Spartiate," " Berwick " and " Terrible " refitting.

H.M. Dockyard, Chatham.

Name of Vessel.	Built of	Owners			I.H.P.
† Twin Screw Tug, Pilot (slightly different from Rover)	Steel	Building	[illegible]		[illegible] N.D.
† Twin Screw Tug, Atlas (details different from Rover. Lines the same as Rover)		„	[illegible]		1,400 N.D.
c 2 No. Self-Propelled Store Lighters [illegible] tons	Steel		[illegible]		[illegible]
2 No. 60 ton Store Lighters for Sheerness			[illegible]		
Vulcan, converting into Mother Ship	„	—	6,625 (former disp.)		7,200 N.D. 12,000 F.D.
Ganges II. (late Agincourt), now C109, converting into a Coal Depôt	Iron		[illegible] (former disp.)		Engines being removed.
6 No. Vessels having large refits	—	—	—	—	—
[illegible] No. Vessels having annual refits			—		
[illegible] No. Vessels having moderate repairs			—		

H.M. Dockyard, Devonport.

[illegible] Temeraire	Steel	—	—	—	[illegible]

H.M. Dockyard, Pembroke.

Defence completing .	Steel	—	14,[illegible]	—	[illegible]
Bellona building	.		[illegible]	—	[illegible]

Geo. Brown & Co., Garvel Shipyard, Greenwich.—One Steamer, about 200 tons gross.

Gill & Sons, Bridge Yard, Rochester.

Motor Yacht Ketch	B.H.P.

Steam Pinnace for Admiralty; Three 32 ft. Sailing Cutters.

G. Rennie & Co., Thames Street, Greenwich.

Camel No. 2, Salvage Vessel	—	British	700 (nearly completed)			
No. 1090, Train Ferry Paddle Steamer, 160 ft.	—	Foreign	500	„	„	300
No. 1092, Screw Tug	—	British	150	„	„	350
Nos. 1094-9, 6 Special Coaling Vessels, each 2[illegible]		Foreign	[illegible] building			

Camper & Nicholson, Ltd., Gosport, Hants.

m No. 15[illegible] Schooner Yacht	Wood			[illegible]
m No. 154 Motor Yacht			[illegible]	[illegible]
* No. 15[illegible] Steam Yacht	.		2[illegible]	[illegible]
No. 15[illegible] Cutter Yacht	.		.	

R. Cock & Sons, Quay, Appledore, R.S.O., Devon.—Steel 3-mast Schooner duplicate to vessel launched.

Day, Summers & Co., Ltd., Southampton.

Steam Yacht (Screw Schooner)	—	220	—	2[illegible]

J. & W. S. Harvey, Littlehampton.—Have another, similar model and class but a little larger, ready for launching.

Philip & Son, Ltd., Dartmouth.

Delta and Gamma .	Steel	British	140ea	—	[illegible]ea
* 4, 52½ ft. Admiralty Launches	Wood	„	40ea	—	80ea

Geo. & Thos. Smith, Ltd., Rye, Sussex.—Sister ship to vessel launched.

Stow & Sons, Shoreham.

New Sailing Yacht [illegible] tons	Wood	—	[illegible]	—	—
Aux. (Motor) Sailing Yacht	.		[illegible]		—
Aux. (Motor) Sailing Yacht	„	—	50ab	—	—

J. Samuel White & Co., Ltd., East Cowes.—7 vessels, 39,630 I.H.P.

Isaac J. Abdela & Mitchell, Ltd., Brimscombe, Stroud, Glos.—5 Steam Launches, 3 motor craft, 4 Steel Boats, 5 sets of engines.

Dee Shipbuilding Co., Ltd., Queen's Ferry, near Chester.—4 Tugs of a collective tonnage of about 370 and 770 I.H.P.

Isaac Pimblott & Sons, Northwich, Cheshire.—A few small orders.

* Compound. † Triple. c Single Cylinder.
t Turbine. m Motor.

Thomas Sumner & Sons (Liverpool), Ltd., Liverpool.

No. [illegible] (hull only)	Steel	British	50	—	—
No. [illegible] (hull only)	Wood	,,	1	—	—

D. Williams, Portmadoc. Building a vessel for the Newfoundland trade, [illegible] survey, 13 years A1 at Lloyd's, to be launched latter end of [illegible], 1909.

Lytham Shipbuilding and Engineering Co., Lytham.

[illegible]gon, 124 ft. Paddle Wheel Steamer	Steel	Foreign
* Ruwenzori, 100 ft. Stern Wheel Steamer	,,	,,

Baird Bros., North Shields. Are very busy in new work at present, and are fitting out a large screw tug for local owners. They have in hand also three sets of Twin-Screw Triple-Expansion Engines for Messrs. Sir Wm. Armstrong, Whitworth & Co., at Walker Shipyard. In addition to above new work, they have a fair amount of overhaul or repair work in hand and to come on to.

J. W. Brooks & Co., Ltd., Lowestoft.

60 ft. Cruiser	W. B. McLearon, Harwich	2/4	Twin internal combustion.
[illegible] ft. ,,	J. W. Brooke & Co., Ltd.	18	internal combustion
Launch		18	,,
True-to-the-Core (Life-boat), alterations		4	,,

Crabtree & Co., Great Yarmouth.—5 Compounds and 1 Triple engine of 1,000 I.H.P. collectively.

Hepple & Co., Ltd., South Shields.

* Screw Tug	Hepple & Co., Ltd.	160	130
* Coasting Steamer		300	140
* Twin-Screw Tug	Hepple & Co., Ltd.	350	135

MacColl & Pollock, Sunderland.—Five Sets of Marine Engines, with 13 additional boilers.

Plenty & Son, Ltd., Newbury.

* ———	965	120
† ———	800	160

W. Sisson & Co., Ltd., Gloucester.—Chiefly consists of "Sisson" High-Speed Enclosed Engines, including fan installations and electric light engines for two mail steamers, being built by Messrs. Cammell, Laird & Co., Ltd., Birkenhead.

Vauxhall & West Hydraulic Engineering Co., Ltd., Luton.

Dalesman	H. Scarr & Co.	195	120
‡‡———	Cook, Welton & Gemmel	390	130
‡‡———	Edwards & Co.	130	150
	Total I.H.P.	715	

SCOTCH.

Alley & MacLellan, Polmadie, Glasgow.—Three Steel Barges for carrying oil in bulk, 150 tons gross each.

Fleming & Ferguson, Ltd., Paisley, N.B.

Name of Vessel	Built of	Owners	G.T. Regis.	G.T. inclu. erect.	I.H.P.
4 Vessels	Steel		—	3,200	4,500

Grangemouth & Greenock Dockyard Co., Greenock.—Two large Oil-carrying Steamers.

A. Hall & Co., Ltd., Aberdeen.—Four vessels building, with a gross tonnage of about 700 tons and an I.H.P. of about 1,300.

London & Glasgow E. & I. S. Co., Ltd., Glasgow.—Twin-Screw Mail and Passenger Steamer, Osterley, for Orient Line, of about 12,500 tons gross and [illegible] 1[illegible],000 I.H.P.; 1 Torpedo Boat Destroyer for H.M. Service.

Peter MacGregor & Sons, Kirkintilloch.—One small Trawler, 1 Tug.

A. Munro, Ardrishaig.—Two boats on hand.

Ritchie, Graham & Milne, Whiteinch, Clyde.—Two 20-ton Barges.

A. Robertson & Co., Sandbank, S.O., Argyllshire, Clyde.—Three Sailing Yachts, 4 tons T.M.; 1 motor Launch, 2 tons T.M.

Scott & Sons, Bowling, N.B.—3 Steamers about 500 tons in all.

John Cran & Co., Leith.

* Steam Tug	Steel	—	200	—	780

Grangemouth & Greenock Dockyard Co., Grangemouth.—One Passenger and Cargo Steamer of fair size for Indian owners.

Scott of Kinghorn, Ltd., Kinghorn.—One Vessel (Transport), building for the Spanish Government; also Donkey Boilers and Steam-Steering Gear made during year.

J. Weatherhead, Eyemouth.—Trade quiet, two or three motor engines to fix in Scottish boats as auxiliary power.

The Caledon Shipbuilding & Engineering Co., Ltd., Dundee.

[illegible] No. 206	—	British	1,3[illegible]0	—	1,250
Cupid	—	—	641		50
[illegible] No. 20[illegible]	—	—	[illegible]		100
[illegible] No. 2[illegible]	—	British	2,[illegible]08		1,700

The Dundee Shipbuilding Co., Ltd., Dundee.—Two Steamers, 1 Trawler.

Montrose Shipbuilding Co., Montrose.

* No. 44 (fore and aft Rig)	Steel	110	220

SCOTCH ENGINES.

Aitchison, Blair & Co., Clydebank.

Name of Vessel	Builders	I.H.P.	Press. lbs.
‡Single Screw		140	130
,,		170	140

Cooper & Greig, Dundee.

[illegible] Triple	Home Owners	700	—

J. Cran & Co., Leith.

* Steam Tug	John Cran & Co.	780	120

* Compound. † Triple. ‡ High Pressure.

Fisher & Co., Paisley.

Name of Vessel	Builders.	I.H.P.	Press. lbs.
‡‡Name not known	P. McGregor & Sons, Kirkintilloch	140	120
‡‡ ,,	,,	140	130
‡‡ ,,	J. Fullerton & Co., Paisley	400	1[illegible]
‡‡ ,,	,,	400	1[illegible]
† ,,	Scott & Sons, Bowling	380	160
† ,,	,,	380	160
	Total..	1,840	

Gaudie, Gillespie & Co., Glasgow.

* 1 Set Engines	Walker, Maryport	160	130
* 1 ,, ,,	Brown & Co., Greenock	160	1[illegible]

Menzies & Co., Ltd., Leith.—1 Set Marine Machinery for Steam Herring Drifter.

S. & H. Morton & Co., Leith.—A few repairs.

Ross & Duncan, Govan.—15 Sets of 5,750 Horse-power.
Output in 1907, 39 Sets of 10,73[illegible] horse-power.

IRISH.

The Dublin Dockyard Co., Dublin.—Two Steamers, 1,200 tons.

Larne Shipbuilding Co., Larne.—Eight Barges, 100 tons each.

MacColl & Co., Ltd., Abercorn Basin, Belfast.

Name of Vessel.	Builders.	I.H.P.	Press. lbs.
* New S.S.		900	

WORK ON HAND IN FOREIGN YARDS.

FRENCH.

L'Anonymes des Chantiers et Ateliers de la Gironde, Bordeaux.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
t Vergniaud	Steel				22,500
t Cimeterre T.B.	,,				13,500
t Dague ,,	,,			—	13,500

Ateliers et Chantiers de Normandie a Grande-Quevilly, nr. Rouen.

One steel cargo boat of 6,000 tons gross tonnage, and one torpedo-boat destroyer for the French Navy.

Schneider & Co., Creusot.

† Edgar Quinet, Cruiser	—	Brest	14,570		36,000
† S.T. Destroyer		—	440		8,000
Q-82, Submarine		Brest	5[illegible]0		1,700

Societe Anonyme des Chantiers de St. Nazaris, Penhoet.

t Diderot, Steam	—	Brest	18,000dis	—	25,000
† Paul Leferme, Steam	—	Saint Nazaire	300dis	—	450

BELGIAN.

Chantiers Navals Anversois, Hoboken-by-Antwerp.

Two spar deckers of 2,000 tons deadweight, single screw, and two hopper barges.

Charles Delsaux, Boom.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
Terine, Barge	Steel	Paris	385	422	—
Pole Nord ,,	,,	Liége	658	712	—
Nannie ,,	,,	Grammont	378	422	—
Oku ,,	,,	Gent	460	51[illegible]	—

Societe Anonyme John Cockerill, Hoboken.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
† Princesse Marie Jose	Steel	Antwerp	2,370	2,460	1,550
m No. 484	,,	Ostend	—	101	30
No. CCCCVI, Barge		Belgium	—	110	—
‡ No. 485, Screw Tug	—	Congo		13	30
‡ No. 486, Stern Wheel	—	,,		58	125
a Nos. 487-488, Screw Tugs	,,	Belgium		100	250
† No. 489, Screw Steamer	,,	Antwerp	—	100	230
No. CDXII, Barge	,,	Belgium		110	—
m No. 490, Vedette I	,,	Ostend	—	8	35
No. CDXIV, Barge	,,	Belgium	—	150	—
† No. 491, Gunboat	,,	Ostend	—	150	400

DUTCH.

Arnhem & Co., Arnhem.

Name of Vessel	Built of	Owners	G.T. Regis.	G.T. inclu. erect.	I.H.P.
† Rijn & Lek, III	—	Vreeswijk	—	200	300
† Theodora		Dordrecht	—	220	400
† No. 65, Tug		Dordrecht		310	600
† No. 66, ,,		,,		250	450
† No. 67, ,,		Antwerp		230	450
† No. 68, ,,		Rotterdam		230	450
† No. 69, ,,	–	Duisburg		190	300
* Nos. 70 & 71, Dredgers	—	Nijmegen		250ea	100ea
*	—		—	—	100
c Engines only	—	—	—	—	25
*	—	—	—	—	100
c	—	—	—	—	25
† No. 72, Tug		Duisburg		140	200
† No. 73, ,,		Luttich		150	275

Wed C. Boele & Son, Slikkerveer, bij. Rotterdam.—Lighter of 1,100 tons.

Bonn & Mees, Rotterdam.

† Gorontalo	Steel	Rotterdam	5,900		2,400
Barge	,,	,,	40		—
† Terschelling	,,	,,	3,500	—	1,500

* Compound. † Triple. ‡ High Pressure. a Quadruple. c Single Cylinder. m Motor. t Turbine.

Jonker Gebr. Scheeps Baumeisters, Kinderdijk.

* 1 Tug of 150 I.H.P. and 2 Lighters.

Koninklijke Nederlandsche Grofsmederij, Leiden.

Name of Vessel	Built of	Owners	G.T. Regis	G.T. inclu. erect	I.H.P.
* Dredger		Holland	320	—	[illegible]
* Larvoe		East Indies	—		25
14 Barges		Argentine	—	—	—

Maatschappij voor Scheeps-en-Werktuigbouw, Fijenoord, Rotterdam.

Name of Vessel	Built of	Owners	G.T. Regis	G.T. inclu. erect	I.H.P.
† America, Dredger	Steel	—	—	—	180
† Europa	,,		—		150
† Atjeh, Schooner	,,	Batavia	400		500
† Nos. 227 and 228, Schooners	,,	,,	2,900ea		1,600ea
† Nos. 229/231, Hopper Barges	,,	,,	—	—	

J. Meyer's Shipbuilding Co., Zalt Bommel.

Bucket Dredger and several Lighters.

Nederlandsche Scheepsbouw-Maatschappij, Amsterdam.

Name of Vessel	Built of	Owners	G.T. Regis	G.T. inclu. erect	I.H.P.
† Nias	Steel	Amsterdam	[illegible]	—	2,300
† Hoofdinspecteur Zeeman	,,	Batavia	400	—	800
Utrecht and Limburg		Balik Papan	1,200ea	—	—
† 2 Vessels, unnamed	,,	Batavia	3,100ea	—	1,300ea

A. J. Otto & Son, Krimpen, a.d. Yssel.

Two Lighters of about 650 tons for Bremen.
One ,, ,, 300 ,, Rotterdam.
Two ,, ,, 2000 ,, Duisburg.

J. J. Pattje & Son, Waterhuizen, nr. Groningen.

Yacht Schooner of 140 tons d.w., and Schooner of 230 tons d.w.

J. & K. Smit's Schupswerven, Kinderdijk.

Name of Vessel.	Built of	Owners.	G.T. Regis	G.T. inclu erect	I.H.P.
† M.O.P. 21C, Bucket Dredger		B. Ayres	350		550
* M.O.P. 22C, ,,		,,	200	—	200
† Zeeland		Vlissingen	300	—	800
* No. 613 Dredger	—	Goteborg	140		275

Jan Smit Czn, Alblasserdam.

Name of Vessel	Built of	Owners	G.T. Regis	G.T. inclu. erect	I.H.P.
† Noordwijk Schooner	Steel	Rotterdam	—	2,275	1,200

Firma A. F. Smulders, Schiedam.

Name of Vessel	Built of	Owners	G.T. Regis	G.T. inclu. erect	I.H.P.
* Bucket Dredger	—	—	320		200
* Suction Dredger	—	—	300	—	450
17 Barges	—		8,500	—	—
* 2 Suction Dredgers	—	—	900		400
* Self-propelling Coaling Vessel		—	1,000		300
* Idem		—	1,600		600

W. F. Stoel & Zoon, Alkmaar.

7 Steel Motor Boats and 2 small boats.

A. Vuijk & Zonen, Capelle a/d Yssel.

Cargo Steamer of about 1,200 tons gross, and six barges of about 2,000 tons gross.

Van Vliet & Co., Hardinxveld.

4 River Lighters of 1,500 tons for Antwerp, and cargo steamer of 900 tons for London.

N. V. Werf v/h Rijkee & Co., Rotterdam.

3 Steamers together 5,000 tons gross, with 2,000 I.H.P.

Werf Conrad Ltd, Haarlem.

Name of Vessel	Built of	Owners	G.T. Regis	G.T. inclu. erect	I.H.P.
* Nos. 381/382, Gold Dredgers	—	—	105	—	40
* No. 383 ,,		—	115		155
† No. 394, Dredger		Danube	550		880
* No. 398, Barge and Suction Dredger	—	Dutch ports and rivers	150	—	230
* No. 399, Dredger	—	Renong	300	—	265
Nos. 401/402, Barges		Cherbourg	220		—
Nos. 403/404		,,	235		—

Alblasserdamsche Engineering Works, Alblasserdam.

Name of Vessel	Owners	G.T.	I.H.P.
* Names unknown (Tugs)	Gebrs. Jonker	135	135
*	,,	135	135
†	Wed. C. Boele & Zoon	240	180
†	,,	240	180

Kinderdijk Engineering Works, Der Kinderdijk.

Name of Vessel	Owners	G.T.	I.H.P.
† M.O.P. 21C	T. & K. Smit's Scheepswerven	600	165
* M.O.P. 22C	,, ,, ,,	200	90
† Zeeland	,, ,, ,,	600	165
* Mr. J. Loudon	,, ,, ,,	200	105
* ——— ——— ———	T. & K. Smit's Scheepswerven	300	105

Lohnis & Co., Rotterdam.

Name of Vessel	Owners	G.T.	I.H.P.
* Randwijk	Boele & Pot, Bolnes	330	120
* Antonia I.	Gebrs. Pot, Bolnes	130	120

Netherlands Engineering Co., Amsterdam.

Name of Vessel	Owners	G.T.	I.H.P.
† Nias	Nederl. Scheepsb. M.T.	2,400	180
† Zeeman	,, ,,	800	170
† Pollux		1,200	180
† De Zeven Provincien (Twin-Screw Battleship)	Naval Yard, Amsterdam	7,200	250
† S.S. ———	Nederl. Scheepsb. M.T.	1,500	180
† S.S. ———	,, ,,	1,500	180

Stork Bros. & Co., Hengelo.

Name of Vessel	Owners	G.T.	I.H.P.
* Gold Dredger	Werf Conrad, Haarlem	100	100
* ,, ,,	,,	75	100
* Tin Suction Dredger	,,	550	160
* ,, ,,	,,	275	160

Hilton's Engineering and Shipbuilding Co., Rotterdam.

Name of Vessel	Owners	G.T.	I.H.P.
† Nos. 206 and 207	Hilton	250ea	150ea
p Nos. 208 and 209	,,	50ea	
No. 210	,,	—	—
† Combinatie I	Only engines and boilers	700	205
† Peruvia and Batavier II.	Only boilers	—	180ea

* Compound. † Triple, *p* Petrol.

GERMAN.

Actien Gesellschaft Weser, Bremen.

Name of Vessel.	Built of	Owners	G.T. Regis	G.T. inclu. erect	I.H.P.
Ersatz Beowulf	Steel	German Navy			

Blohm & Voss, Hamburg.

Name of Vessel	Built of	Owners	G.T. Regis	G.T. inclu. erect	I.H.P.
t Cleveland	Steel	Hamburg			
t "F"	,,	Large cruiser for German Navy			
Ferry-boat	,,	Hamburg			
t "G"	,,	Large cruiser for German Navy			
Training-ship	,,	Bremen			
Pontoons.					

Also a Floating Dock of about 35,000 tons lifting capacity.

Heinrich Bradenburg, Hamburg.

Name of Vessel	Built of	Owners	G.T. Regis	G.T. inclu. erect	I.H.P.
* S 229, Steam tug			[illegible]		[illegible]
* S 230			[illegible]		[illegible]
* S 226, 238-240, 4 Steam Launches			[illegible]		[illegible]

Eiderwerft Actiengesellschaft, Tonning.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
* Arngast	Steel	Wilhelmshaven	—	200	80
No. 89 Lightship	—	Tonning	—	[illegible]	
† No. 90, Cargo Steamer	Steel	Harburg	—	650	400
Nos. 91 & 92, Lighters		Kiel	—	[illegible]ea	—
No. 93, Lighter	—	,,	—	[illegible]	—

Flensburg Shipbuilding Co., Ltd., Flensburg.

Name of Vessel	Built of	Owners	G.T. Regis	G.T. inclu. erect	I.H.P.
No. 283, Pontoon Dock	Steel	Stettin	—	2,020ab	—
No. 284	,,	,,		[illegible]ab	
No. 285, Floating Dock	,,	,,	—	[illegible]ab	—
a Buffalo	,,	Hamburg	—	6,700ab	3,000
† No. 287	,,	,,	—	[illegible]ab	[illegible]
† No. 288	,,	—		[illegible]ab	2,700

T. A. Hitzler, Lauenburg, Elbe.

Name of Vessel	Built of	Owners	G.T. Regis	G.T. inclu. erect	I.H.P.
m S 222, Boat	Steel		—	800	23
m S 223 ,,	,,	—	—		17
S 220, Lighter	,,	—		210	

R. Holtz, Harburg.

Name of Vessel	Built of	Owners	G.T. Regis	G.T. inclu. erect	I.H.P.
1 Vessel	Steel	Foreign		[illegible]	[illegible]

Howaldtswerke, Kiel.

Pontoon and Battleship .. —

J. W. K. Klawitter, Danzig.

Name of Vessel	Built of	Owners	G.T. Regis	G.T. inclu. erect	I.H.P.
* No. 343	Steel		[illegible]	—	[illegible]
No. 344	,,		200	—	—
No. 345	,,	—	100		180

Henry Koch, Lubeck.

Name of Vessel	Built of	Owners	G.T. Regis	G.T. inclu. erect	I.H.P.
* Helgenaes	Steel	Aarhus	170	170	260
† s.s. No. 194	,,	Hamburg	1,775	2,290	900

Fried. Krupp Aktiengesellschaft Germaniawerft, Kiel-Gaarden.

Name of Vessel	Built of	Owners	G.T. Regis	G.T. inclu. erect	I.H.P.
Posen	Steel	Kiel	ab. 18,000 dis.	—	—
m U 4	,,	Pola	240		[illegible]
m S 140	,,	Kristiania			
t S 141, 142-146 and 152	,,	Kiel			
m S 147-150	,,	,,			
S 151	,,	,,			

C. Luhring, Brake, I.O.

Name of Vessel	Built of	Owners	G.T. Regis	G.T. inclu. erect	I.H.P.
No. 93 (Schooner)	Steel	Brake	120		
No. 94 (Schooner)	,,	,,	225	—	—
No. 95 (Schooner)	,,	Geestemunde	120		

Jos. L. Meyer, Papenburg, a.d. Ems.

4 Tugs, total, 244 tons; 665 I.H.P.; 1 Hopper Barge, 300 tons.

Nuscke & Co., Stettin-Grabow.

Name of Vessel	Built of	Owners	G.T. Regis	G.T. inclu. erect	I.H.P.
† Otto Eppen III.	Steel	Stettin	80	—	300
No. 180	,,	—	742	—	450
No. 181	,,	Stettin	60		150
No. 182	,,	Wismar	600	—	[illegible]

Oderwerke Aktien Gesellschaft, Stettin.

Name of Vessel	Built of	Owners	G.T. Regis	G.T. inclu. erect	I.H.P.
Cargo Steamer	Steel	Hamburg	840	—	600
† Cargo Steamer		,,	2,500		1,100
* Cargo Steamer	,,	Emden	300	—	200
† Cargo Steamer		Stettin	610		400

Reiherstieg Schiffswerfte und Maschinenfabrik, Hamburg.

Name of Vessel	Built of	Owners	G.T. Regis	G.T. inclu. erect	I.H.P.
* No. 425, Steam Launch	Steel	Hamburg	—		[illegible]

Rickmers & Co., Bremerhaven.

Name of Vessel	Built of	Owners	G.T. Regis	G.T. inclu. erect	I.H.P.
† Sabine Rickmers	Steel	Bremerhaven		4,170	1,600
† Etha Rickmers	,,	,,	—	4,170	1,600
† No. 157	,,	,,		4,170	1,600

Schiffswerfte und Maschinenfabrik (vormals Janssen und Schmilinsky) A. G. Hamburg.

Name of Vessel	Built of	Owners	G.T. Regis	G.T. inclu. erect	I.H.P.
* No. 50[illegible]	Steel	Altona			12[illegible]
* No. 504	,,	Wismar			200

G. Seebeck, A. G. Bremerhaven.

Name of Vessel	Built of	Owners	G.T. Regis	G.T. inclu. erect	I.H.P.
† Bjorn (Icebreaker)	—	Randers		[illegible]	450
† Geier		Copenhagen		[illegible]	700
† No. 286		Montevideo		[illegible]	700
* Nos. 287 to 291 (Tugboats)		Buenos Ayres		[illegible]ea	150ea

H. C. Stulcken Sohn, Hamburg.

Name of Vessel	Built of	Owners	G.T. Regis	G.T. inclu. erect	I.H.P.
† No. 359 (Trawler)	Steel	Cuxhaven		[illegible]	410
* Nos. 365, 366 and 368, Steam Launches	Wood			[illegible]ea	16ea
No. 377 (Barge)	Steel	Hamburg		[illegible]	
* No. 383 (Launch)	,,	,,		[illegible]	75

* Compound. † Triple. *a* Quadruple. *m* Motor. *t* Turbine.

Vulcan & Co., Stettin.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
[illegible] and Kaiser Fer- [illegible]					
[illegible]	Steel	Wilhelmshaven	[illegible]	[illegible]	[illegible]
[illegible] Battleship		Kiel		11,[illegible]	20,000
[illegible] Cruiser				[illegible]	25,000
George Washington, Cruiser [illegible] Passenger and Freight Ship		Bremen	21,000	[illegible]	20,000
† s.s. 292 and 293 (Railway Steam Ferry		Sassnitz	2,500ea	2,100ea	[illegible]
[illegible] (Tug and [illegible] Steamer)	..	Stettin	[illegible]	70	[illegible]

J. H. N. Wichorst, Hamburg.

* Tugs	Steel	Hamburg	24	—	[illegible]

North German Lloyd, Bremerhaven.

[illegible] George Washington	Vulcan, Stettin	[illegible]		21
[illegible] Berlin	Act. Ges. Weser, Bremen	14,[illegible]		220

Gebruder Sachsenberg, Rosslau & Deutz.

Preussen		Halle a. S.			
Wer Frankf. Reedereien ..		Homburg a. Rhein	[illegible]	—	1,100
Kronprinzessin Cecilie		Fustenberg a. O.			600
[illegible] Hamel XIV	—	Ruhrort	[illegible]		1,280
Wurtemburg, Baden and Hessen	—	Dresden	[illegible]		[illegible]ea
613, Floating Crane ..				—	
614, Passenger Steamer Siegfried				—	—
Mathias Stines				—	1,[illegible]00

DANISH.

Aktieselskabet Burmeister & Wains, Copenhagen.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
No. [illegible]	Steel	Ronne	730	—	850

The Shipyard is engaged with sundry repair work and lengthening a large Steam Ferry, 40 ft.; dimensions, 290 ft. by 58 ft. by 17 ft. and 1,400 H.P.

Copenhagen Floating Dock & Shipworks, Ltd., Copenhagen.

1 Barge and 1 Passenger Steamer — — —

Elsinore Iron Shipbuilding and Engineering Co., Elsinore.

* No. 122 (Schooner)	Steel	—	1,075ab	700

SWEDISH.

Bergsunds Mekaniska Verkstads Aktiebolag, Stockholm.

Name of Vessel.	Built of	Owners	G.T. Regis.	G.T. inclu. erect.	I.H.P.
* [illegible] 1st T.B. ..		Swedish Navy			1,800

Eriksbergs Mek. Verkstads Aktiebolag, Goteborg.

† S.S. No. 143	Steel	Stockholm	145	350	550
* S.S. No. 144	,,	Goteborg	197	242	150

The Goteborgs Nya Verkstads Aktiebolag, Goteborg.

[illegible] 1st-class T.B.'s	—	R. Swedish Navy	1,108dis ea		1,[illegible]ea
S. 307, Dredger	—	Goteborg	300dis	—	—
* S.S. 309, Tugboat	—	Russian	708ab	—	200
S. [illegible], Motor-boat					
S. [illegible], Tugboat		Goteborg	[illegible]ab		[illegible]

Helsinborgs Varfs, Aktiebolag.

Steel Vessel, [illegible] about [illegible] tons d.w.

Kockums Mek. Verkstads Aktiebolag, Malmo.

[illegible], T.B.D. — Swedish Navy — 7,200

Lodose Wharf Co., Ltd., Lodose, Goteborg.—Sailing vessel "Roxane" being altered from sail to steam, 500 d.w.

Motala Verkstads Nya Aktiebolag, Motala.—Two steam ferries of same [illegible] launched, and one motor boat for the Swedish Government.

Oskarshamns Mek. Verkstads och Skippsdockas Aktiebolag, Oskarshamn.

* [illegible] IX	Steel	Kalmar	300
[illegible]	,,	Swedish Navy	220

Porsgrund Mek. Verkstad, Porsgrund.

* [illegible] Whaler	Sandefjord	[illegible]
* [illegible] steamer		100

NORWEGIAN.

Akers Mek. Værksted, Christiania.

Name of Vessel.	Built of	Owners.	G.T. Regis	G.T. inclu. erect.	I.H.P.
[illegible] 267 [illegible]	Steel	Christiania		[illegible] eab	450ab
† No. [illegible]				[illegible] ,,	450 ,,
† No. [illegible], [illegible]	,,	Molde		[illegible] ,,	600 ,,
† No. 282, Halden	,,	Fredrikshald	—	200 ,,	360 ,,
† No. [illegible]	,,	Christiania	—	1,1[illegible] ,,	[illegible] ,,
[illegible]	,,	Skien		1[illegible] ,,	400 ,,
† [illegible]		[illegible]		700 ,,	700 ,,
[illegible] engines only					1[illegible] ,,

Aktieselskabet Fredriksstad Mek. Værksted.

Kattegat ..	Steel	Helsingborg	—	1,075ab	800
Cargo Steamer		Kristiania		1,075ab	800
* Dredger		[illegible]			80
* Tug					[illegible]
Cargo Steamer		Kristiania		1,0[illegible]0ab	800

Christiansand Mechanical Works, Christiansand.

[illegible]	Steel	[illegible]	70ab	2[illegible]
[illegible] Schooner		Bergen	1,[illegible]0ab	2[illegible]

Frammœs Mek. Værksted, Sandjeford.

[illegible] for Nylands Værksted, Christiania, self-docking type (to be built in three parts), lifting powers 3,500 tons.

* Compound. † Triple. a Quadruple. t Turbine.

Laxevaags Shipbuilding and Engineering Co., Bergen.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
s.s. No. [illegible]2	Steel	Bergen	1,000	1,150	—
s.s. No. [illegible]	,,	,,	780	950	

Nylands Værksted, Christiania.

† No. 1[illegible]7 (Cargo Steamer)	Steel	Arendal		675al	450
† No. 198 ,,	,,	Christiania		1,[illegible]0ab	900
* No. 199 (Whaler)	,,	,,	—	112	280
No. 200 (Lighter)	,,	,,	—		—

Stavanger Stobert & Dok, Stavanger.

* s.s. No. [illegible], Schooner	Steel	Arendal	420ab	—	[illegible]00ab
† s.s. No. 60 ,,	,,	,,	420ab	—	300ab
† s.s. No. 61 ,,	,,	,,	420ab	..	300ab
† s.s. No. 62 ,,	,,	,,	420ab		300ab

Trondhjems Værksted, Drontheim.

† ————	Steel	Stokmarkner	—	800	1,000
† ————	,,	Trondhjem	—	1,100	630
† ————	,,	Christiansund	—	250	500

AUSTRIAN.

Austrian Lloyd, Trieste.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
† Nos. 116, 117 and 118 ..	Steel	Trieste		[illegible],857ea	2,200ea

Marco U. Martinolich, Lussinpiccolo.

* Narenta and No. 150 ..	Steel	Zara	—	164	350

Stabilimento Tecnico Triestino.

No. [illegible]82 Motor Launch of 70 tons gross and 100 B.H.P. for Trieste.
3 Battleships of 14,500 tons displacement and 20,000 I.H.P. each, for the Austro-Hungarian Navy.
1 Turbine plant of 20,000 I.H.P. for 3,500 tons Cruiser for the Austro-Hungarian Navy.
No. 391 Cargo Steamer of 4,500 tons D.W. and 1,800 I.H.P., for Trieste.
No. 392 Motor Launch of 22 tons gross and 200 B.H.P. for Constantinople.
No. 393/398, 6 Torpedo Boats of 110 tons displacement and 2,300 I.H.P. each, for the Austro-Hungarian Navy.
No. 399/400, 2 Passenger and Cargo Steamers of 77[illegible] tons D.W. and 1,400 I.H.P. each, for Trieste.
No. 401 Passenger Steamer for Coast Service of 120 tons gross and 500 I.H.P. for Capo d' Istria.
No. 402 Oil Lighter of 51 tons D.W., for the Austro-Hungarian Navy.
No. 403/407 Tenders of 47 tons displacement and 170 I.H.P., each, for the Austro-Hungarian Navy.

HUNGARIAN.

Danubius S. & E. Co., Ltd., Budapest.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
* No. 1040	Steel	Budapest		—	650
* ————	,,	Plattensee		—	80
Dredger	,,	Budapest	—	—	
Several Steel Lighters ..	—	—	—	—	—

Erst Ku. K. Priv. Donau Dampfschiffahrts-Gesellschaft, Budapest.

11 Open Barges	Steel	—	—	321	—
* 2 Side Paddle-wheel Tug	Steel		—	—	900

ITALIAN.

Sicilian Naval Dockyard, Palermo.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
a Principe Umberto	Steel	Palermo		7,817	8,100
a Duca d'Aosta ..	,,	,,	—	7,817	8,100

Cantieri Navale Di Miggiano, Spezia.

Oceania, sister ship of vessel launched .. — — —

Societa Anonimi Gio. Ansaldo Armstrong & Cia., Sestri-Ponente.

† No. 150, Protected Cruiser ..	Steel	Constantinople	2,000	—	12,500
† from No. 145 to No. 150, T.B. Destroyers	,,	unknown	334	—	6,000

SPANISH.

Euskalduna Shipbuilding Co., Bilbao.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
† s.s. Cabo Blanco ..	Steel	Sevilla	—	2,100	—

Government Shipbuilding Yard, El Ferrot, Corunna.

Reina Regente, being fitted up — — — —

RUSSIAN.

T. R. Eales & Son, St. Petersburg.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
† Tug			60dis.		100

* Cargo Boat for canal work, for 100 tons of cargo.
* Cargo Boat for Ladoga and Onega Lake, for 300 tons of cargo, twin screw, each engine 120 I.H.P.

GRECIAN.

Ateliers & Chantiers Hellenique Basiliades, Piræus.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.

Ship and Machinery repairs and dry docking of vessels.

* Compound. † Triple. a Quadruple.

AMERICAN.

W. Irving Adams & Son, East Boothbay, Maine.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
† Sch. Aux	Oak	Portland	-	48	[illegible]

American Car and Foundry Co., Wilmington, Del.

No. 24 Dump Scow	Wood	Norfolk	1,200	—	—
Nos. 12 and 14 Dump Scow	..	Providence, R.I.	1,000ea	—	—
Grain Barge	..	Philadelphia	700	—	—

The Baker Yacht Basin Inc., Quincy, Mass.—1 70-ft. twin-screw gasoline cruiser, 2 32-ft. single-screw gasoline boats, 1 [illegible]-ft. boat, and 1 25-ft. boat.

H. S. Bowker & Son, Phippsburg, Maine.—Keel laid for a 3-masted schooner.

M. M. Davis & Son, Solomons, Maryland.—Tug boat for A. J. Taylor & Bro., Washington, D.C., 11[illegible] ft. by 22 ft. by 13 ft., triple expansion, 750 H.P.; Fishing steamer for Hunt on Poulson, Guano Co., Reedville, Va., 135 ft. by 22 ft. by 12 ft.

G. G. Deering Co., Bath, Maine.—4-masted schooner in frame.

Fore River Shipbuilding Co., Quincy, Mass.—Two 250 ton Destroyers, fitted with Curtis turbines; four Steel Car-floats; seven Submarine Boats of Holland type.

Gildersleeves Shipyard, Gildersleeve, Conn.—Six Wooden Deck Lighters, 110 ft. by 32 ft. by 9½ ft. deep; one Wooden Coal Barge, 100 ft. by 30 ft. by 12½ ft. deep.

The Great Lakes Engineering Co., Detroit, Mich.—three Bulk Freight steamers with triple engines; four Steel Scows; two Package Freighters and one double-ended Ferry Steamer.

Harlan & Hollingsworth Corporation, Wilmington, Del.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
† L. I. Sound, Freight and Passenger Steamer, No. 1	Steel	New York	2,984	2,680	2,000ab
Do. do. do. No. 2	,,	,,	2,984	2,680	2,000 ,,

George Lawley & Sons Corporation, S. Boston, Mass.

m 112 ft. Launch	-	New York			[illegible]00
90 ft. W. E. Schooner	-	Boston	-		

Manitowoc Dry Dock Co., Manitowoc.—Passenger Steamer, 200 ft. keel, 214 ft. over all, 40 ft. beam, 17 ft. deep, triple-expansion engine, 2,500 H.P., for Michigan City, Ind.; Survey Boat, 92 ft. keel, 100 ft. over all, 20 ft. beam, 10 ft. deep, Triple and compound $\frac{16-32}{24}$ for U.S. Government; Package Lighter, 140 ft. over all, 36 ft. beam, 15 ft. deep, double 16 by 16 engine.

Maryland Steel Co., Sparrow's Point, M.D.—Rock Drill Barge for Isthmian Canal Co., and three Collier Vessels for Maryland Steel Co., 385 ft. by 53 ft. by 32 ft. 6 in.

Moran Company, Seattle, Washington.

Name of Vessel.	Built of	Owners	G.T. Regis.	G.T. inclu. erect.	I.H.P.
† Vessel 50 (Schooner)	Steel	—	—	1,838	850

Machinery for Dredge for Isthmian Canal Commission, miscellaneous repair work aggregating approximately 3,500 tons gross.

Neilson Yacht Building Co., Baltimore, Maryland.—Four Yachts, 60 ft., 36 ft., 30 ft., and 26 ft.

Newport News Shipbuilding & Dry Dock Co., Newport, News.

Name of Vessel	Built of	Owners	G.T. Regis.	G.T. inclu. erect.	I.H.P.
Battleship Delaware	Steel	U.S. Navy	—	—	—
Torpedo Boat Destroyer Roe	,,	,,			
Torpedo Boat Destroyer Terry	,,	,,			
† Freight Ship (not named) ..	,,	—	—	2,800	1,500
† Wooden Tug (not named) .	Wood	-	-	150	500
† Cable-Layer Jos. Henry ..	Steel	U.S. War Dept.	—	790	1,000
Passenger Steamer Southland	..	Washington D.C.	—	2,000	3,000

New York Shipbuilding Co., Camden, New Jersey.—Utah, Battleship, 22,000 tons displacement; eight Coast Coal Barges of 2,000 tons each, for Lehega Valley R.R. Co.; three Torpedo Boat Destroyers for U.S. Navy; three Mine Planters for Quartermaster Dept., U.S. Army; twin-screw steamers of 680 tons displacement.

Pittsburg Steamship Co., Cleveland.

† ————	Steel	Duluth	7,200ab		1,800
† ————	,,	,,	7,200ab	—	1,800

James Rees & Sons, Co., Pittsburg.—Two Stern Wheel Light-Draught Steam Boats, 170 ft. long, 33 ft. breadth of beam, 4 ft. 6 in. depth of hold, with three longitudinal bulkheads and five cross ditto, all watertight, the frames of 2 by 3 in. angles spaced 18 in. apart, plating all double riveted throughout of 3/16 galvanized open hearth; 60,000 T.S. steel engines, high pressure, 15½ in. diameter of cylinder, 6 ft. stroke, with three tubular externally fired boilers, set in iron casing, brick and asbestos lined, with two chimneys, Western River practice, for use on the Magadel River Republic of Colombia, S.A.

Risdon Iron and Locomotive Works, San Francisco.—Two Twin-Screw Steel Fireboats for the City of San Francisco, length p/p 120 ft., breadth moulded 26 ft., depth moulded 12 ft. 9 in., fitted with water tube boilers and compound engines.

g Compound Diagonal. † Triple. m Motor.

Joseph Supple, Portland, Oregon.

Name of Vessel.	Built of	Owner	G.T. Regis.	G.T. inclu. erect.	I.H.P.
† Hyak Sound Steamer	[illegible]	W[illegible]		2[illegible]	7[illegible]

The greater part of output is in barges and other craft, not self-propelling.

Toledo Shipbuilding Co., Toledo, Ohio.

† Contract 114 Steamer	Steel				1,8[illegible]

United States Navy Yard, California.—U.S.S. Prometheus, steel, raised bridge and forecastle type, rig [illegible], displacement [illegible], 26 ft. draught, deadweight 6,500 tons, speed 16 knots, engines, twin-screw, triple-expansion, size, 28 in., 44½ in., 75 in. by 54 in. stroke. Revolutions per minute 86, boilers six Babcox & Wilcox water tube, working pressure 225 lbs. per sq. in.; and sixteen [illegible] ton wood [illegible] Coal Barges.

United States Navy Yard, New York.—[illegible] No. [illegible]; 2 steel fire-control towers, U.S.

The Charles Ward Engineering Works, Charleston, West Virginia.—Yacht, 86 ft. by 11 ft. by 4 ft. 3 in deep, draft 2 ft., 125 H.P.

Gasoline engine, 6 cylinders, steel hull.

Two Triple-Expansion Engines, 7½ in., 12½ in., 20 in. by 12 in.

,, ,, ,, [illegible] in., 1[illegible] in., 25 in. by 18 in.

,, ,, ,, 11½ in., 19½ in., [illegible] in. by 20 in.

Thirty-six Launch boilers.

CANADIAN.

T. Bigeton, Canning, N.S.—Three-masted schooner about 300 tons rig, being built by Captain W. H. Baxter.

H. Wagner, Mahone Bay, N.S.—97-ton Schooner and 150-ton Steamboat.

STRAITS SETTLEMENTS.

Singapore Slipway and Engineering Co., Ltd., Singapore.—* One Teakwood Steam Launch, 60 ft. by 13 ft. by 6 ft. moulded, 11[illegible] I.H.P.

* One Teakwood Steam Launch, 58 ft. by 10½ ft. by 5 ft. moulded, 42 I.H.P.

Tanjong Pagar Dock Board, Singapore.—Steel Caisson, and two wood screw launches.

JAPANESE.

Mitseu Bishi Dockyard and Engine Warks, Nagasaki.

Name of Vessel.	Built of	Owners.	G.T. Regis.	G.T. inclu. erect.	I.H.P.
‡ Kitano-Maru	Steel	Tokio		8,[illegible]	7,000
† Yd. No. 200, 201 and 202	,,	Osaka		6,000ea	[illegible],900ea
‡ ,, 203	,,	Tokio		1[illegible],700	16,8[illegible]
,, 204 and 205	,,			[illegible],200ea	3,500ea
‡ ,, 206	,,			[illegible],204	[illegible]

Onos Shipbuilding Yard, Osaka.

No. 11, Kyado Maru one-mast sloop	Steel	Takushima, Awa		80ab	70
‡ No. 6, Ono Maru, 2-masted schooner	,,	Osaka		80ab	[illegible]

Osaka Iron Works, Osaka.

Nos. 592-597 (Barges) ..	Steel	(97 ft. by 19 ft. by 5 ft. 6 in.)
† No. 576 (Steamer)	,,	(210 ft. by 30 ft. by 20 ft.)
† No. 586 ,, ...	,,	(135 ft. by 28 ft. 6 in. by 16 ft.)
† No. 603 ,, ...	,,	about 760
† No. 608 (Trawler)	,,	(95 ft. by 20 ft. by 11 ft. 6 in.)
† No. 609 (Steamer)	,,	(93 ft. by 18 ft. 3 in. by 11 ft.)
No. 610 (Dredger)	,,	

Owakio Shipyard, Shanagawa, Tokio.

* Kayomaru	Wood	Tokio	1,000	1,100

Vessel designed for Japan West Coast trade.

AUSTRALIAN.

Adelaide Steamship Co., Adelaide.—Koombana, of 3760 tons gross and triple engines, 423 N.H.P.

Morrison & Sinclair, Balmain, N.S.W.—Ferry Steamer.

Morts Dock and Engineering Co., Ltd., Balmain, Sydney, N.S.W.

Triple Expansion Engines & Boilers for Sydney Ferries ..	Double Ended Screw Steamer (Machinery only)	580
Compound Engine & Boiler for River Steamer	Single Screw (Machinery only)	280

INDIAN.

Burn & Co., Ltd., Howrah, Bengal.—Several Barges, Flats and Launches.

* Compound. † Triple. ‡ Turbine.

Industrial and Trade Notes.

THE CLYDE AND SCOTLAND.

(*From our Own Correspondent.*)

Work of the Year.—The record of events and progress for the monthly period is, as usual at the close of the year, eclipsed in interest by the record of the whole twelve months' doings. In view of this the notes dealing with December will be brief, chief interest of course centring in the statistical information given on other pages. Writing within measurable hail of the completion of 1908, it is possible to forecast with a fair degree of accuracy the result of the year's industry as regards output of tonnage. As might have been anticipated from a perusal of these notes month by month, 1908 has been characterized by very severe depression, not alone as regards particular districts or firms, but generally speaking all over the Clyde and other Scottish centres. As regards the Clyde, the total output will not exceed, if it even reaches, 360,000 tons, which figure is less by as much as 260,000 tons (in itself equivalent to an annual output for less busy centres than the Clyde) than last year's aggregate of 620,000 tons. As regards the output of individual firms the list is again headed by Messrs Russell & Co., Port Glasgow, whose output reaches the considerable figure of 48,620 tons. Even in this case there is a marked decrease, and this renowned Port Glasgow firm has always been noted for its activity when other firms have, as a rule, been experiencing slackness. Many of the Clyde firms, noted for high-class productions especially, have suffered from acute absence of orders, and quite a number which usually take high place in the output list are on this occasion found very near the bottom position. Of some notable contributory items to the year's aggregate simple mention may be made. There was added to the "Fleets of the Mail Lines" the *Salsette*, 6,000 tons, and the *Malwa*, 11,500 tons, both for the P. & O. Co., by Messrs. Caird & Co., Greenock; the *Morea*, 12,000 tons, for the same renowned line, by Messrs. Barclay, Curle & Co., Whiteinch; the *Orcoma*, 11,500 tons, for the Pacific S.N. Co., by Messrs William Beardmore, Dalmuir; the *Makuri*, 8,530 tons, for the Union Steamship Co. of New Zealand, by Messrs. Alex. Stephen & Sons, Linthouse; and the *Orsova* and the *Otway*, each of 12,000 tons, for the Orient S.N. Co., the former by Messrs. John Brown & Co., Clydebank, and the latter by the Fairfield Co., Govan. A specially interesting vessel, as regards her propulsive machinery at least, was the *Otaki*, of 7,200 tons, produced by Messrs Denny Bros., Dumbarton, and fitted with a combination of reciprocating and turbine engines by Messrs Denny & Co. This vessel is the first merchant steamer to be fitted with engines of both kinds and her owners, the Union Steamship Co. of New Zealand, are deserving of great credit for their enterprise in leading off in a line of development in marine engineering quite evidently destined to continue. In naval shipbuilding the Clyde has not done much during 1908, but the torpedo destroyers turned out by Messrs. Denny Bros., of Dumbarton, and those by Messrs. Yarrow & Co., of Scotstoun—who for the first time figure in the annual record of Clyde shipbuilding—sustain the reputation of the district for high-class work. In warship machinery also Clyde firms have not been entirely inactive. Amongst vessels of a specialized character produced mention should be made of the oil steamers *Tamarac*, of 4,900 tons, built by Messrs Napier & Miller, of Old Kilpatrick, for the Anglo-American Oil Co., and the *Pure Light*, of 4,490 tons, built by the Greenock and Grangemouth Dockyard Co. for the Pure Oil Co., of Hamburg and New Jersey. Similarly some allusion is due to the elevating deck vehicular ferry steamer *Finnieston I.*, built by Messrs. Ferguson Bros., Port Glasgow, and now doing excellent service across the harbour of Glasgow at Finnieston. Dredgers of a variety of types have also, as usual, formed a feature of the year's work, the firms of Messrs. William Simons & Co., Renfrew, Ferguson Bros., Port Glasgow, Lobnitz & Co., Renfrew, and Fleming and Ferguson, Paisley, all having contributed of their specialities. Barges, trawlers, tugs, pontoons and the customary variety of smaller craft are all in evidence in the year's record.

Recent Orders.—As regards naval engineering work, the Clyde has secured more than half the amount of the machinery for the vessels to be laid down in Royal dockyards. Messrs. John Brown & Co., Clydebank, it is understood, have secured the contract for the turbine-propelling machinery of the armoured cruiser which is to be laid down at Devonport. This machinery is to be of 43,000 H.P., involving turbines which are somewhat larger than ordinary firms have up till now constructed. On this account four concerns only were asked to tender, namely, Messrs. John Brown & Co., Clydebank, The Fairfield Shipbuilding & Engineering Co., Govan, The Wallsend Slipway Co., Wallsend, and the Parsons Steam Turbine Co., Wallsend. Indirectly, also, the Clydebank firm have succeeded in securing a further order of naval engineering work in the shape of the turbines for the propelling machinery of the battleship to be laid down at Portsmouth. The contractors in this case, however, are Messrs. Harland & Wolff, Ltd., of Belfast, who, availing themselves of their association with the Clydebank firm, and its superior, if not unique, experience in the production of turbines of large power, have arranged that the turbines will be made at Clydebank.

Messrs A. & J. Inglis (Limited), Pointhouse, have secured from the Entre Rios Railway Company, Buenos Ayres, an order for a train transfer steamer of about 1700 tons gross. The vessel will be similar in general dimensions to the twin-screw steamers *Lucia Carbro*, built at Pointhouse in 1907, and the *Maria Parera*, built last year, both for the same owners.

New P. and O. Liners.—On separate days about mid-month speed trials were run on the Clyde by the new P. & O. Steamer *Malwa*, built by Messrs. Caird & Co., Greenock. In her preliminary trials over "the measured mile" at Skelmorlie the vessel attained a speed of 18½ knots, which is in excess of the contract. The working of her machinery gave great satisfaction to representatives of the P. & O. Co. on board. Her sister vessel, the *Mantua*, will shortly be launched from Messrs. Caird & Co.'s stocks.

Bull's Metal Propellers.—During the past year the demand for propellers of Bull's metal, either in the solid form or made of separate blades with special design of boss, has been fully maintained as compared with the output of the two preceding years, notwithstanding the depression in shipping and shipbuilding which has characterized most of the period. Amongst notably successful items supplied mention may be made of the solid propeller fitted to the Donaldson liner *Cassandra* where the increase in speed is about ¾-knot on the old consumption, the same as in the case of the S.S. *Athenia* belonging to the same line, and fitted last year. A still more successful case was the fitting to the Allan liner *Pretorian* of a solid propeller in Bull's metal to replace four loose propeller blades. The solid propeller in this case was at the time the largest solid bronze propeller known to have been fitted to a ship, the diameter being 19 ft. 6 ins. and weight 11½ tons. The speed increase in this case was fully ¾-knot at a reduced consumption. The brass and bronze rolling mill at the works of Bull's Metal and Melloid Co., at Yoker (the only one in Scotland), has now been at work for about 18 months, the results of working being highly satisfactory. The tests herewith of Bull's Metal Bars are in themselves eloquent enough of the results obtained. The Company, in addition, supply other tensile bronzes, yellow metal and naval brass, in the round and hexagonal form, tests of the naval brass showing considerable superiority over ordinary naval brass.

TESTS OF BULL'S METAL ROLLED AT YOKER—1908.

(Bars varying in diameter from 1" to 3¼".)

Diameter.	Breaking Strain. Tons per sq. in.	Extension. % on 2".	Diameter.	Breaking Strain. Tons per sq. in.	Extension. % on 2".
691	33·83	34·37	718	37·74	23·43
686	35·27	29·68	680	39·67	20·31
·692	37·23	25·	688	41·30	17·18

Composition identical. Finish varying to suit requirements.

Perth Gauge Glasses.—During the past year the demand for these well-known boiler gauge glasses has been steadily on the increase notwithstanding the depression in shipping which has characterized most of the period. In the case, especially, of the gauge glass of Moncrieff's manufacture, to which the term "Unific" has been applied, this experience is most marked. This product of the well-known Perth firm was put on the market only about a decade ago and was the result of prolonged research and exhaustive experiment as to a reliable glass for the highest pressures in use, either in marine or locomotive practice. Ever since then the demand for the glass has been steadily expanding with shipowners and railway companies and with others wherever boilers of high pressure were in question. Wherever the glass has been tried it has given the utmost satisfaction, and shipowners in particular have appreciated the special advantage it affords to them, in that it provides the certainty of a glass that will be secure and in every way efficient during the term of a steamer's round journey. Burst glasses and the possible or probable danger to stokehold hands and operations are matters unknown in the experience of users, and the economy accruing from this fact in the matter of lessened wear-and-tear, not only in glasses but in fitments, including the many types of gauge-glass protectors, is an advantage more and more appreciated.

THE TYNE.

(From our Own Correspondent.)

The Shipbuilding Outlook.—It has been intimated that Messrs. Stephensons' yard at Hebburn is to be closed for a period, owing to the lack of orders for new tonnage. Luckily, the repairing department is still in full swing, the graving dock being constantly occupied. The enterprise of the firm in making the dock is now receiving something like adequate reward, and it is quite certain that if the dock had been designed on a smaller scale, and less elaborately equipped, it would not be such a profit-making asset, as it has been found to be. It is not improbable that one or two other yards, may also be temperarily closed, as an alternative step to running the machinery for practically no achievement in the shape of work turned out. A few weeks ago there came a small spurt in shipbuilding, and a few orders were placed; but this symptom of improvement has proved to be delusive, and nothing better than a "flash in the pan." Some very high authorities, including the Prime Minister, express a confident belief in the return of a busy time in shipbuilding and marine engineering; but there are circumstances which render it impossible that these industries should ever again show the pressure of activity that has been witnessed in former periods of revival. Among the restrictive circumstances referred to, may be mentioned the increased efficiency of machinery; the growing tendency to displace the smaller class of slow-running cargo boats by leviathans, having propelling powers of the highest; and lastly, the competition of foreign countries that were formerly our customers, but have now become our rivals in production. A revival of demand for new ships will, of course, be manifested as soon as demand has overtaken supply; but when this happens, other countries besides England, will be claiming a share of the orders that may be going. The question then will be—"Who can offer most prompt delivery, combined with lowest prices?" If England can do this, she may still be able to beat all competitors; but to achieve or hold this position of pre-eminence, trade union leaders and trade union members will have to adopt more reasonable methods in dealing with the employers, than they have been exhibiting during the year now closing.

The Output Returns.—The objectionable practice of prematurely publishing output returns of tonnage has this year again been resorted to by certain North Country newspapers, and we have noticed such returns purporting to represent the output for the whole year appearing in the first week of December. The object is, apparently, to gain some credit for smartness by anticipating other journals; but it is obvious that no returns can be absolutely reliable excepting those that are published at the close of the year; for only the latter can include with certainty all that has been done. We understand that in many cases firms have declined to supply information as to output before a specified date, their object being to avoid assisting in the publication of inaccurate returns, and that was a course of action most highly to be commended, as such returns possess no value if not trustworthy.

Messrs. Hawthorn, Leslie & Co.—It is announced that this firm have secured an order for a passenger steamer to be 300 feet in length, the construction of which will be proceeded with immediately. This is certainly a welcome piece of news for Hebburn, where much distress from unemployment has existed, and this order, though not a large one, will doubtless enable the firm to set on more hands. It is also stated that there are contracts for the repairing department, which will keep a large section of men engaged for several weeks to come.

Messrs. Armstrong, Whitworth & Co.—This Company's Elswick yard still presents a good show of work, all the vessels in course of building being for Government services at home and abroad. In the Company's Low Walker yard there are vacant berths; but enough work is in hand to keep a good proportion of the hands employed, till well into the New Year. Messrs. Dobson's yard keeps fairly well employed, and at the establishment of Messrs. Wood, Skinner & Co., Bill Quay, there are two or three vessels in active progress on the stocks. In the lower reaches of the river, repair work is fairly plentiful, the Smiths' Dock Company being particularly busy. The number of steamers laid up continues to be very large, a circumstance which clearly shows the lack of animation in shipping.

Engineering Work.—The North-Eastern Marine Engine Works, Wallsend, have, as compared with other works, shown an appearance of briskness throughout the year, excepting, of course, the period during which a large proportion of the operatives were on strike. At no time, however, were the works standing wholly idle, and it is very creditable to the management that so large a quantity of work was turned out, as is represented by over 71,000 I.H.P. This, large as it is, is far short of the previeus year's output, which however, constituted a record.

The Wallsend Slipway Company's Works are keeping fairly busy, and the Neptune Works, Low Walker, are also doing moderately well. Engineering works at Gateshead are in some cases, showing signs of improvement, the electrical establishments being fairly well off for orders. At Walkergate, business does not seem particularly active, and the prospect for next near, is far from reassuring. Throughout the district generally, ironfounding work is still slack.

THE WEAR.

(From our Own Correspondent.)

Work in the Shipyards.—At the North Sands Yard (Messrs. J. L. Thompson & Sons), there are three vessels in more or less advanced stages, and extensive repairs are being carried out on a locally-owned steamer, in one of the Wear Commissioners' graving docks. The firm's Manor Quay Works are also pretty busy, the fitting- ut of vessels being the principal work in hand. Messrs. Blumer and Messrs. Crown & Sons, have each one vessel in hand, and the Sunderland Shipbuilding Company have a couple of vessels nearing completion. Messrs. Bertram have only one berth occupied; but a large steamer, to be extensively repaired by this firm, is expected in the port shortly.

During the past few weeks, Messrs. Austin have been exceptionally busy with repair work, their graving dock and pontoon having been almost constantly occupied. It is now known that two of the eight steamers to be ordered by Sir Christopher Furness, from firms outside the Hartlepool area, are to be built by Messrs. Osborne, Graham&o, of the North Hylton Yard. This work will give a much-needed stimulus to business at that centre. The outlook at Messrs Doxfords' large establishment has improved, and frame furnaces, which for some time had been inoperative, have again been started. Messrs. Short Brothers are keeping fairly busy; but at Messrs. Priestman's and Messrs. Pickersgill's there is not much doing. Messrs. Robert Thompson and Sons, have their berths fully occupied, and at their Bridge Dockyard, there are still repair contracts in hand. Several firms that have work to go on with, have put their men on three-quarter time, and though in one or two cases, some opposition to this course was manifested, the bulk of the men have given their tacit consent to the arrangement.

Marine Engine Works.—The marine engine works generally continue to show a lack of animation, and from one of the largest establishments a number of men have been discharged since the beginning of the month. There appears to be no sign of coming activity in the ironfounding trade, and so long as dulness exists in this branch, no improvement need be looked for in general engineering work. Local ironworks are slack; but at Messrs. Tyzack 's, patent furnaces for the manufacture of steel, according to an improved process, are being installed. It is expected that when these furnaces are completed, work will be provided for a considerable number of men.

Throughout the whole of the North-Eastern centres, it is being found necessary to form organizations for the relief of distress, caused by scarcity of work, and though at the time of writing, there is little prospect of better things coming with the advent of the new year, that event is looked forward to with some degree of hope, as with the coming of the longer days, it is thought some new schemes of work may be inaugurated.

THAMES.

(From our Own Correspondent.)

Port of London Bill.—This important measure has passed through both Houses of Parliament, and is now virtually therefore part of the law of the land. As might be expected,

the Upper House devoted considerable attention to the Bill, and added a clause somewhat unexpectedly, *viz.*, that referring to additional members to the authority, one each for Essex and Kent. Another point introduced by the Lords was in favour of the river interests which were said to be prejudiced by arrangements previously agreed upon, and which gives these interests a reduction in charges of from £330,000 to £110,000. The House of Commons have also made a new departure from precedent in the Bill, by enabling the New Port Authority to acquire land without going to Parliament. It was thought at one time that the measure would be carried over to next session, but pressure was used by the Government, and a date is now fixed for the new Authority to take over its great charge, and the Act comes into operation, *viz.*, March 31st, 1909. So, though not without dissentient voices, the measure has gone through, perhaps chiefly because it was engineered so skilfully at the outset. It should prove a workable statute, but large public bodies do not necessarily make for efficiency, the expenses are heavy, and responsibility cannot be fixed for errors.

Council Steamboats.—It is now finally settled that these boats shall be given up. There has, from the report, been a deficiency of £128,000 in three years on steamboats and piers, but it is said, that even supposing the boats are disposed of on fairly advantageous terms, the loss to the public cannot be much less than £250,000, by this experiment; the auditors give it as higher than this with their full figures.

London Steamship Cos.—The P. & O. have had their general meeting. The Chairman mentioned the amount of tonnage laid up, and described the year as bad for the trade of this country. The Company, however, pays its usual dividend, though there is a decline in profit. After providing for the Preference dividend the report says, a total of 13 per cent is paid on the Deferred shares for the year.

With the Orient Co., the Fairfield Shipbuilding Co. have launched the *Otway*, a new twin-screw of 12,000 tons. The dimensions are 552 ft. by 63 ft. 3 ins., and 46 ft. depth. Divided into ten water-tight compartments, the vessel is fitted for wireless telegraphy, and with every means to ensure the best ventilation and sanitation. A similar vessel, the *Orsova*, was launched by Messrs. John Brown & Co. The third is being built on the Clyde and two at Belfast.

When the Ellerman Co. have acquired the Bucknall Line, it will be the second in point of size in this country, the largest being that of the British India. The Ellerman Co., with the addition, will have 112 steamers with a tonnage of 420,000. London is therefore the head-quarters of the largest of our Steam Shipping Cos., and it is to be hoped that with increased facilities afforded by the Bill she will not lag behind.

Government Contracts.—Very little of these have come Thames way. The Thames Engineering Co. have secured only one, a destroyer, and at an interview which the Poplar Borough Council had with the First Lord of the Admiralty, the latter remarked, that the disparity in prices between the Thames and the North precluded any possibility of more being placed on this river, and as to acquiring Yarrow's yard, this the Government were not prepared to do, having already sufficient facilities for repair and not being prepared to enter into competition for new work. The price for the vessel given out is said to be about £100,000.

Maritime Conference.—An important International Conference has been called together by His Majesty's Government, to discuss the question of a Code for the International Prize Court to submit to the Hague Conference. The subjects refer to the conduct of war on the high seas, contraband, the right of neutrals to supply coal to belligerents and the destruction of neutral prizes at sea. Delegates from all the leading shipping countries have met together in London, but it will be some time before the results are fully known. In view of the losses Shipping Companies were many of them put to in the late Russo-Japanese War, a meeting of the kind appears necessary.

NORTH-WEST OF ENGLAND.

(*From our Own Correspondent.*)

Review of the Year.—The amount of work turned out during the year has not been great. There have been no large vessels for the British or any other navy launched during 1908, the only large warship handled being the Russian cruiser *Rurik*. This vessel arrived at Kronstadt on October 18th, and is at present undergoing alterations by special contract by Vickers Co. It is expected that the work will occupy some time and the workmen may not be through with it until well on in next year. The other vessels launched or delivered this year are given in our returns. The work in hand is by far more important. It includes the British Dreadnought *Vanguard*, whose keel was laid on April 1st, the Brazilian battleship *San Paulo*, the twin-screw icebreaker for the Canadian Government, a steam ferry for Brazil, a second-class cruiser for the British Government and a large number of submarines for our own country. In the engine sheds in addition to the machinery for all the above named vessels, there will be begun shortly the machinery for the third Brazilian Dreadnought. It all depends upon when that country decide to have her built. The total launched tonnage this year is 12,487 tons, and the total indicated horse-power, which includes the machinery for the Brazilian battleship *Minas Geraes*, completing at Elswick, and also the two Argentine Gunboats building at the same yard is 58,850. In 1907, the tonnage was 4,882, with horse power, 15,150; 1906, 26,770 tons with 79,000 I.H.P., ; in 1905, 41,900 tons with 64,900 I.H.P. ; and 1904, with 13,170 tons and 40,760 I.H.P.

More Spanish Rumours.—As was forecasted in these columns, the Spanish orders are likely to shape their course to Barrow, at any rate some of them. The latest reports are to the effect that the contracts have been signed and that the work is to be given to Vickers. It is very welcome news, if it is true and there seems every reason to believe that there is something in the latest cable. Of course, the Superior Committee make the representation to the Minister of Marine. The voting was six in favour of Vickers and three, including the President, in favour of the Ansaldo firm, at Genoa. That seems to be how matters stand at the moment. Vickers, at any rate seem to be well in the running, as there are six members in its favour while only three are for the Genoa firm, who have not had the experience that the Barrow-Sheffield firm has. The matter will now rest with the Minister of the Marine and the Government and possibly before long, we shall hear the result. Of course, if Vickers get the order there will be a regular division of work for Armstrong, Whitworth & Co., Sir John Brown and Thorneycrofts will all share, it is said. No single firm could handle the whole of the work in the time specified—and there will be penalties attached to it, no doubt. The vessels are to be built in Spain and are said to consist of five battleships of the Lord Nelson type. Spain would be well advised if they had them built in England, where there are all the appliances. They would certainly get a better battleship. As to all these vessels being of the *Lord Nelson* type, that can hardly be swallowed. The total amount of the contract is about £8,000,000. That would hardly pay for five of these vessels and the other schemes of bringing their present navy up-to-date. As all the guns, gun mountings and armour will be made in England, together with the propelling machinery, there would be plenty of work for many hands in this country. Vickers Co., when approached said they could not confirm the news of the orders but "hoped it would come off."

The Argentine Rumours and Decisions.—The news to hand from Buenos Ayres is interesting. Many papers had a difficulty in placing this report. Some credited Brazil, one Chili. Their geography was at fault. It has been cabled that on Wednesday, the Chamber of Deputies at Buenos Ayres had finally sanctioned a bill authorising the Government to spend about £14,000,000 on armaments, including an increase in the navy and the purchase of artillery and rifles. The bill provides for the construction of two large battleships, but authorises the building of a third, if necessary. This means a chance of more work for Barrow, amongst other yards. Brazil, with its new navy in prospect seems to be waking the others up, as was suggested in these notes last month. It seems as if the *Minas Geraes* and the *San Paulo* were to go to Brazil after all. The possibility of the Argentine building a third battleship would appear to depend upon Brazil building the *Rio Janero*. There seems to be no doubt about the decision on the part of Argentine, so one may now expect Chili to come out into the market and order something for herself. Whenever she has in the past, some other country scenting trouble has snapped up the vessels. Perhaps the time is arriving when these South American countries are

arriving at the conclusion that the most powerful fleet round that coast will be able to say most. There will be a lot of competition for the work, in which money will play a prominent part in the transaction. In this respect, one has not much fear for Vickers. There will certainly be a bigger demand in the early future for the Vickers submarines. Their successes with those for the British Admiralty are sufficient for any other sea power. Altogether the outlook is much more brighter. It looks as if what with the British work to be placed and foreign orders that we are in for a brisk period of warship building, and the sooner the better, for the depression has been keen and the amount of unemployment very great.

The Launching of the Dreadnoughts.—There has been another re-arrangement of the dates for launching of the Brazilian Dreadnought *San Paulo* and the British Dreadnought *Vanguard*. It was at first thought that the Brazilian would be off first, but the arrangements as they stand now are that the *Vanguard* shall go in to the water on February 22nd next year and that the *San Paulo* is to be launched on March 20th. There may be a further alteration, but it is hardly likely.

Submarine Construction.—During the month the fiftieth submarine built to the order of the British Admiralty has been launched. There are a great number to be built yet and they are becoming larger and more powerful, both as regards speed and striking power.

Ice Breaker.—The Ice breaker, which is being built to the order of the Canadian Government is to be 250 ft. long and 47 ft. 6 in. wide. The depth is 26 ft. 6 in. She will be about 600 tons and will have about 6,000 h.p. Her speed with twin-screw will be about 10 knots.

Hæmatites.—There has been a further fall in hæmatites and two more furnaces have been put out in the district. Makers are asking 58s. 6d. per ton net f.o.b. for Mixed Bessemer Nor, while the last transaction in warrants was 57s. 9d. per ton for one month. The steel trade is very dull. There has been a large importation of manganese ore from Bombay during this month, which constitutes a record. This ore is used in the special furnaces at Workington, and the iron is commanding a good market both at home and abroad.

Shipping.—Shipping is only moderate. There has been a slight improvement in imports, but in exports of iron and steel there is little doing. The total shipments this year to date are about 420,000 tons, as compared with 740,000 tons in the corresponding period of 1907—a decrease of 320,000 tons.

SOUTHAMPTON.

(From our Own Correspondent.)

Messrs. Day, Summers & Co., Ltd., Northam Ironworks, have booked an order for a slipway cradle capable of hauling up vessels of 1000 tons for foreign clients. During December alterations were in hand in connection with the machinery for a slipway they recently supplied to enable it to deal with vessels of similar weight. The keel of the new 230-tons yacht for Col. Gascoigne was laid early in December, and the framing etc., is now well advanced.

"St. Paul" *v.* H.M.S. "Gladiator."—Judgment has been given by the Lord Chief Justice in the action brought by the Admiralty against the decision of Justice Barnes, who held that the cruiser *Gladiator* was alone to blame for the disastrous collision between the above vessels which occurred in a snowstorm in April last in the Solent. His Lordship remarked that the vessels sighted one another at a time when a collision could have been averted, and that the disaster was caused by the improper starboarding of His Majesty's vessel.

Messrs. R. & J. H. Rea have added another up-to-date collier to their fleet. The new vessel has been built at Middlesbrough, and is named the *Queensgarth*. She has been built specially for the owners' coal trade to this port, and is constructed on the cantilever frame system with side ballast tanks. The leading dimensions of the vessel are as follows :—Length, 283 ft. 6 in. by 40 ft. 3½ in. by 23 ft. depth moulded, and has a deadweight carrying capacity of about 3200 tons on a light draught of water. She has been built under special survey for the highest class under British Corporation rules. Triple-expansion engines with cylinders 22 in., 35 in. and 59 in. diameter respectively, and with a stroke of 39 in., have been fitted and are supplied with steam at 180 lbs. per square inch by two single-ended boilers.

Messrs. Elder, Dempster & Co. will shortly have two new twin-screw steamers sailing from this port on their Antwerp, Southampton and West Coast of Africa service. The new steamers will bear the same names as two steamers at present on this route the *Leopoldville* and the *Bruxellesville*. The new *Leopoldville* has just completed her maiden voyage, and the *Bruxellesville* was launched in December. The new vessels have extensive passenger accommodation and will be capable of carrying a large cargo on a limited draught, and are a big advance on the older steamers which they will displace.

Messrs. J. I. Thornycroft & Co., Ltd.—The ss. *Paso de Cuevas* river steamer for Argentina was successfully launched on the 23rd December last, and is now fitting out. The ss. *Paso de la Patria*, a sister vessel, sailed from this port for Argentina on the 22nd December last. The first-class torpedo boat destroyer *Amazon* is complete and ready to be handed over. H.M. T.B.D. *Nubian*. Work is steadily proceeding on this vessel, and the propeller brackets, rudder, etc., are all erected. H.M. first-class torpedo boat No. 31 has successfully passed her principal trials, including the eight hours' full-speed trial and twenty-four hours' consumption and steering trials. H.M. first-class torpedo boat No. 32 was launched on 23rd November last, and she is fitting out ready for her trials. Other work in hand during December embraced repairs to ss. *Kharki*, which had a new tail shaft and repairs to engines, also docking and painting work to Admiralty transports ss.'s *Plassy*, *Dongala*, *Soudan* and *Rohilla*. Work is also proceeding on a tug boat for China and a passenger flat, which is now in frame and partly plated.

BELFAST.

(From our Own Correspondent.)

The Past Year.—Belfast shipbuilders not having suffered to any great extent from the acute depression in the shipbuilding trade as experienced, and being experienced, in other centres, naturally stand out most prominently in the returns for output of new tonnage during 1908, Messrs. Harland and Wolff's total exceeding that at the head of the returns for 1907. Altogether the record of work carried out here during the past twelve months leaves little or no room for complaint, and the prospects for 1909 are equally satisfactory.

Messrs. Harland & Wolff.—With the launch of the twin-screw liner *Megantic* on December 10th, Messrs. Harland and Wolff completed their output for 1908. This vessel, as stated in last month's issue, has been built for the White Star line's Canadian service, and is a sister ship of the *Laurentic*, at present fitting out, the two steamers being similar in every respect, except as regards propelling machinery. In addition to these two vessels Messrs. Harland & Wolff have at the fitting-out wharves the Atlantic Transport Company's *Minnewaska* and the Red Star liner *Lapland*. The erection of the gantries and cranes over the lengthened berths at the north end of the yard has now been almost completed, and the cranes have already been utilized in the laying of the keel for the big White Star liner *Olympic*. It is worthy of note that the putting down of the keel of this leviathan was carried out in the short space of six hours, which speaks well for the time that will be saved in the building of vessels of big dimensions. It has been reported on reliable authority that Messrs. Harland & Wolff have received from the Admiralty an order for the construction of engines and boilers for a battleship of even larger dimensions than the *Dreadnought*.

Messrs. Workman, Clark & Co.—There is nothing new to report in connection with this firm, but trade continues to be pretty brisk, and they are reported to have recently contracted for the construction of several new steamers of considerable size.

The Building of Big Ships.—Under the auspices of the Belfast Natural History and Philosophical Society, Mr. E. Wilding, of Messrs. Harland & Wolff's staff, delivered recently an interesting lecture entitled "The growth of a leviathan." Mr. Wilding, who has had an extended experience of shipbuilding, and was formerly a member of the Royal Corps of Naval Constructors, dealt with his subject in an able manner, a large number of interesting and instructive limelight views being shown. The character of the growth during the past sixty years was illustrated, and the extent to which large vessels had been and were being built was dealt with, Belfast's share in this work being duly indicated.

LAUNCHES AND TRIAL TRIPS.

LAUNCHES—English.

Roi Leopold.—Lately Messrs. William Dobson & Co. launched from their shipbuilding yard at Walker, the steel screw steamer *Roi Leopold* which they have built to the order of the Société Anonyme Belge d'Armament et de Navigation, of which Messrs. L. Dens & Co., of Antwerp are the Managers. The vessel is built to Lloyd's highest class, shelter-deck type, and has the following dimensions: Length between perpendiculars 300 ft.; breadth 42 ft.; depth moulded 21 ft. 3 in. The design has been specially prepared for the owners' fruit and general cargo trade to Mediterranean ports, and large power is combined with fine lines so as to maintain a good speed at sea. The machinery, which is being constructed by the North Eastern Marine Engineering Co., Ltd., Wallsend, has cylinders 22 in., 37 in. and 61 in. diameter by 42 in. stroke with three large boilers 180 lbs. pressure. Messrs. Wailes, Dove and Co.'s bitumastic enamel was applied to the bunkers and boiler-room tank and their bitumastic covering to the tank top in boiler room.

Gascony.—On November 23rd, Messrs. R. Craggs & Sons, Limited, launched from their Tees Dockyard, Middlesbrough, the fine steel vessel *Gascony*, built for Messrs. David MacIver, Sons & Co., Ltd., of Liverpool. The ship is built on the "Isherwood" system. In this system of construction, the closely-spaced transverse ribs, with which we are familiar in ordinary vessels, are omitted, and the transverse strength is obtained by fitting on the shell and deck plating a series of strong transverses at widely-spaced intervals. These transverses extend completely round the sides, bottom and deck of ship, and are slotted to allow of longitudinal frames and beams being fitted continuously through the transverses. The new system allows the steamer to be built of greater strength than ordinarily, and at the same time the deadweight carrying capacity is considerably increased. The construction is simplified and all parts are readily accessible, thus reducing maintenance repairs to a minimum, and offering greater facility for damage repairs. The dimensions of the vessel are: Length, 373 ft. 6 in.; breadth, 48 ft.; depth, 23 ft. 6 in., and the steamer, which is of the shelter-deck type, is being built under special survey to take the hghest class with British Corporation. Cellular double bottom is fitted throughout for water ballast, which is also carried in the after peak. Ten steam winches are supplied of the most approved type, driven by marine-type donkey boiler 11 ft. diameter by 10 ft. long, 90 lbs. working pressure. Steam-steering gear is also supplied, and improved quick-warping steam windlass is fitted forward. The arrangements for handling ship and cargo are most complete in every respect, with double derricks throughout, in addition to which there are four special derricks, two to lift 20 tons and two to lift 15 tons, fitted at the main hatches. The construction of hull and machinery has been carried on under the superintendence of Mr. P. H. Roscoe, of Liverpool. The machinery will be fitted by Messrs. Blair & Co., Ltd., of Stockton-on-Tees, and will have cylinders 25 in., 40 in., 68 in. by 45 in., steam being supplied by three large single-ended boilers working at 180 lbs. pressure to the square inch. On leaving the ways the naming ceremony was gracefully performed by Mrs. Andrew MacIver.

Clearfield.—On November 24th, there was launched from the yard of the Tyne Iron Shipbuilding Co., Ltd., of Willington Quay-on-Tyne, a steel screw steamer of the following dimensions, *viz.*: Length, 362 ft.: breadth, 48 ft. 6 in.: depth moulded, 30 ft. 6 in. The vessel, which has been built to the order of Messrs. Hunting & Son, of Newcastle-on-Tyne, is designed for the purpose of carrying petroleum and other oils in bulk, and is built to the highest classification in Bureau Veritas for this type. She is fitted with a very complete pumping installation for dealing with the different classes of oil carried. The machinery which has been constructed by Messrs. The Wallsend Slipway & Engineering, Co., Ltd., consists of engines having cylinders 26 in., 42 in., and 70 in. by 48 in. stroke, with three single-ended boilers working at a pressure of 180 lbs. On leaving the ways the vessel was named the *Clearfield*, by Mrs. C. S. Hunting, of Eachwick Hall, Dalton, Northumberland. During construction, the vessel and engines have been under the inspection of Mr. John Muir, the owners' superintendent.

Ezardian.—On December 7th, Messrs. Wm. Pickersgill and Sons, Ltd., launched from their shipbuilding yard at Southwick, Sunderland, a finely modelled screw steamer built to the order of Messrs. The Goole & West Riding Steam Shipping Co., Ltd., of Goole, for their Continental trade. Her principal dimensions are: Length, 200 ft.; breadth, 31 ft. 6 in.; depth, 13 ft. 7 in.; and she is built under special survey to take Lloyd's highest class. The vessel is built on the deep bulb angle frame principle, and is fitted with cellular bottom, whilst the fore and after peaks are also arranged for water ballast. Accommodation for captain and officers, together with a saloon tastefully finished in mahogany and maple, is fitted under the poop deck, whilst the engineers are accommodated in the bridge, the crew being berthed in the topgallant forecastle. Three large hatches are arranged, with winches and derricks for lifting heavy weights, and flying derricks are also fitted for whipping purposes. The pillars at the sides of hatches have been dispensed with so as to leave large clear holds. She is also fitted with warping capstan aft, steam windlass and steam-steering gear, which is fitted in the engine room with controlling shafting to wheel-house on bridge. She will be rigged as a fore and aft schooner, with steel lower masts and wood top masts. The machinery is being supplied by Messrs. Geo. Clark, Ltd., of Sunderland, being of the triple-expansion type, having cylinders 17 in., 28½ in., 46 in. by 33 in. stroke, steam for which will be supplied from two boilers with a working pressure of 160 lbs., which are designed to give the steamer a speed of about 10½ knots at sea. During construction, the vessel and engines have been under the personal superintendence of Mr. A. E. Smith, of Goole, the owners' superintendent. On leaving the ways she was gracefully christened the *Ezardian*, by Mrs. Farnill, of Hull, who was supported by E. W. Hunter, Esq., the Chairman of the Company, and his Directors, Messrs. Parish, Brown and Blythe, and also a party of guests from Goole, including Jack Bennett, Esq. (manager of Bennett Steam Ship Co., Goole), and Mr. and Mrs. W. Best (Becketts & Co.).

Norden.—On December 8th, this vessel was launched from the North Sands Shipbuilding Yard, Sunderland, by Messrs. Joseph L. Thompson & Sons, Limited, and has been specially constructed to the order of Mr. Peter Brown, of Messrs. Dampskibsselskabet "Norden," of Copenhagen, and is the second vessel built by Messrs. Thompson for these owners. The principal dimensions are: Length overall, 330 ft. 1 in.; breadth, extreme 47 ft. 3 in.; depth, moulded 28 ft. 9¾ in. The vessel has been constructed to Lloyd's highest class, under their special survey, on the two-deck rule, and with a complete shelter deck right fore and aft. The deep-frame system has been adopted, leaving clear holds without obstructions by beams. Provision is made for water ballast in a specially deep cellular double bottom, and also in the fore and after peaks. The vessel will have a good equipment of deck machinery and gear, affording facilities for rapid loading and discharging, being supplied by steam by a large multitubular marine type donkey boiler. The accommodation for the saloon, officers, engineers, etc., is in the bridge, the crew, firemen and petty officers being berthed in fore end of the vessel. The propelling machinery has been constructed by Messrs. John Dickinson & Sons, Ltd., of Sunderland, the sizes of the cylinders being 23 in., 38 in., 62 in. by 42 in. stroke, supplied with steam by two large boilers working at 180 lbs. pressure. There was a large company present at the launch, including Capt. Brunnich, Mr. and Mrs. A. Wackerhagen, Mr. and Mrs. Jorgensen, of South Shields, Mr. Oscar Gad, of Sunderland, Mr. Fenjer, Danish Consul Secretary, Mr. Jacobsen, Sunderland, Mr. Alfred Dickinson, and the builders' representatives. The launch was most successful in every way, the vessel being gracefully christened by Mrs. Jorgensen. During construction the hull and engines have been under the supervision of Capt. Brunnich and Mr. A. Wackerhagen.

Ocean Queen.—On December 8th, Messrs. William Gray and Co., Ltd. launched at West Hartlepool, the handsome steel screw steamer *Ocean Queen*, which they built to the order of Mr. Jacob Christensen, of Bergen. The vessel will have a Board of Trade Passenger certificate and the highest class in Lloyd's. Her dimensions are: Length overall, 356 ft. breadth, 43 ft. 6 in. and depth, 26 ft. 1 in. She is a flush deck vessel with topgallant forecastle, slipper stem and short bowsprit, and is schooner-rigged with two masts. There is a

[illegible] with large skylight, sideboard, piano, etc. There is also [illegible] passengers in houses on the spar deck, the officers and engineers in houses alongside casing, and the crew aft in a large house and in 'tween decks. There is a very efficient installation of electric lighting, electric bells, refrigerating machinery and cold chambers, and the ventilation has received very careful attention to suit the Tropics. The hull is built with deep bulb-angle frames, five water-tight bulkheads, 'tween decks all fore and aft, cellular double bottom and after-peak tank for water ballast, large hatchways and eight steam winches. The masts have derrick tables and outriggers. Steam-steering gear, also hand gear will be fitted in the deck-house aft, patent direct steam windlass, five lifeboats, motor launch, stockless anchors, large whaler-type winch of special design to lift 45 tons, and a complete outfit will be provided for a first-class passenger and cargo steamer. The engines are of the triple-expansion type, manufactured by the Central Marine Engine Works of the builders, and have cylinders 24 in., 38 in. and 64 in. dia. by 42 in. stroke. Steam is generated by two large main boilers and one auxiliary boiler, all adapted for 180 lbs. per square inch. Included in the inventory is a liberal supply of spare gear and outfit. Messrs. Wailes, Dove & Co.'s bitumastic enamel was applied to the bunkers, also engine and boiler room tanks, and their bitumastic covering to the tank top in boiler space and donkey boiler recess. The vessel and machinery have been built under the superintendence of Capt. Chr. Johannessen and Mr. P. Bahnsen on behalf of the owner, and the ceremony of naming the steamer *Ocean Queen*, was gracefully performed by Miss Arundel, of Kensington.

Princesse Clementine.—On December 8th, there was launched from the yard of the Tyne Iron Shipbuilding Co., Ltd., of Willington Quay-on-Tyne, a screw steel steamer, built to the order of Messrs. "Océan" Société Anonyme Belge d'Armement and de Navigation (Messrs. L. Dens & Co., managers), of Antwerp, and of the following dimensions, *viz*:—Length, 310 ft.; breadth, 42 ft.; depth moulded, 21 ft. 3 in., and to Class 100 A 1 at Lloyd's on the shelter-deck rule. This vessel has water ballast fitted right fore and aft on the cellular system, and is also fitted with all modern improvements for the rapid loading and discharging of cargo, including nine double-cylindered steam winches, direct-acting steam windlass, large donkey boiler, steam-steering gear, by Messrs. John Lynn & Co., and Messrs. John Crawford and Sons, Ltd.'s screw gear aft. The engines, which are to be supplied by Messrs. The North Eastern Marine Engineering Co., Ltd., Wallsend-on-Tyne, are of the triple-expansion type, having cylinders 22 in., 37 in. and 61 in. by 42 in. stroke, and working at a pressure of 180 lbs. On leaving the ways the vessel was named the *Princesse Clementine*, by Mrs. Hardy, the wife of Mr. G. R. Hardy, the representative of the managing owners.

Vasari.—On December 8th, a new passenger and cargo steamer of the following dimensions was successfully launched from the yard of her builders, Messrs. Sir Raylton Dixon and Co., Ltd., Middlesbrough-on-Tees: Length, 502 ft.; breadth, 59 ft.; depth, 38 ft. 3 in. The steamer has been specially designed for Messrs. Lamport & Holt's cargo and passenger service between New York, Brazil and the Argentine Republic. Besides being very completely fitted for the carriage of enormous quantities of general cargo, she will have luxurious accommodation for 200 first-class passengers and a large number of intermediate and third-class passengers. The first-class accommodation is absolutely up-to-date, including drawing-rooms, smoking-rooms, barber's shop, laundry, and most elaborate systems of electric lighting and artificial ventilation, large ventilating fans being placed in all the reception rooms and also in the state-rooms. The steamer on leaving the ways was gracefully named *Vasari*, by Mrs. Heywood Melly, the vessel taking her name from the Italian painter and biographer, who lived in the year 1512, and so keeping up the tradition of this firm to call their steamers after men who have been famed in the world of art, science and literature. During her building, all details have been superintended by the Company's overlooker, Captain Bird, assisted by Mr. Weaver, while the engines, built by Messrs. Richardsons, Westgarth & Co., Ltd., which are of large dimensions and capable of driving the steamer 14 knots or more, have been superintended by the Company's head engineer, Mr. John Dall, assisted by Mr. Shrigley.

Cabo Carvoeiro.—On December 21st, Messrs. William Dobson & Co. launched from their shipbuilding yard, at Walker, a steel screw steamer which they have built to the order of Messrs. Ybarra & Co., of Seville, for their Spanish coasting trade. The vessel is built to the highest class at Lloyd's of the Awning Deck Class, and has the following dimensions: Length between perpendiculars, 265 ft.; breadth, 38 ft. 6 in.; depth moulded, 26 ft. There are three decks laid, all fore and aft, and accommodation for a limited number of passengers is fitted up aft. The machinery, which is being constructed by Messrs. Blair & Co., Ltd., of Stockton, is of the usual triple-expansion type, having cylinders 19½ in., 32½ in., and 52½ in. diameter by 36 in. stroke, with two single-ended boilers. Before leaving the ways, the ceremony of naming the vessel *Cabo Carvoeiro* was performed by Mrs. Willie Dobson, of Gosforth.

Fiona.—On December 23rd, Sir Raylton Dixon & Co., Ltd., launched from their Cleveland Dockyards, Middlesbrough, a fine steel screw cargo and passenger steamer, built with cantilever frames and topside water ballast tanks, on Harroway and Dixon, John Priestman and Livingstone and Sandersons' Patents to the order of the Colonial Sugar Refining Co., Ltd., of Sydney, N.S.W., for the carriage of molasses in bulk. She is being built to Class 100A1 at Lloyd's, spar deck type, with long poop and forecastle and engines aft. Her leading dimensions are 373 ft. by 52 ft. 1 in. by 28 ft. 4 in. moulded, and she will have a deadweight carrying capacity of about 7,300 tons on a light draught of water. A large steel house amidships will contain saloon, state-rooms for six passengers, officers' accommodation, with captains' cabin above and navigating room on top. The engineers will be accommodated in cabins at sides of engine casing, while the firemen will be berthed in poop 'tween deck aft and crew in forscastle. The vessel has four holds, access to which is obtained by four exceptionally large hatchways, the largest of which is 42 ft. long by 30 ft. wide. The holds are absolutely free from all obstructions such as beams, pillars or webs, and are rendered perfectly self-trimming, owing to the sloping sides of the topside tanks. She will carry the unusually large quantity of about 2,300 tons of water ballast in double bottom, fore and aft peaks and topside tanks, of which the latter contain nearly 1,100 tons. Part of these tanks are also arranged to carry about 1,000 tons of molasses, which, along with the holds, will be fitted up with a very elaborate pumping installation for loading and discharging. She will also have an electric light installation, refrigerating chamber, Harker's patent fire extinguisher, three masts, four boats, six water-tight bulkheads, fresh-water tanks for 4,000 gallons, will be equipped with ten derricks, eight gaffs, ten powerful steam winches, steam windlass, hand and steam steering gear and all the latest and most up-to-date appliances for the efficient working of cargo. Triple-expansion engines placed aft will be fitted by the North-Eastern Marine Engineering Co., Ltd., Sunderland, having cylinders 26 in., 42 in. and 70 in. by 48 in. stroke, supplied with steam by three large single-ended boilers working at 180 lbs. pressure. On leaving the ways, she was gracefully named *Fiona* by Mrs. Adams, daughter of Mr. E. W. Knox, the General Manager of the Colonial Sugar Refining Co., Ltd. The vessel is being constructed under the personal supervision of Mr. J. Pickering, M.I. Mech. E., of Glasgow, consulting engineer for the Company in this country, with Mr. A. McKinley as resident inspector.

Patris.—On December 23rd, an important launch took place at the yard of the Northumberland Shipbuilding Co., Ltd., Howdon-on-Tyne, the vessel being the first of a line of passenger and emigrant steamers ordered by Messrs. Embiricos Bros., of Syra, for the National Steam Navigation Co., Ltd., of Greece. The steamer was named the *Patris*, is 385 ft. long by 47 ft. beam, and is a beautifully modelled vessel, designed for a speed of 16 knots on service, with twin-screw engines of about 4,500 horse-power, built by Messrs. George Clark, Ltd., of Southwick. Four complete decks are laid, on the upper two of which is accommodation for 1300 emigrants, whilst in the long range of saloon houses on the shelter deck is luxurious accommodation for sixty first-class passengers. The requirements of the British Board of Trade, as well as those of the Italian and American Emigration Acts, have been

complied with, and everything necessary for the comfort of the emigrants on the long voyage between Greece and the United States has been carefully thought out, including ample ventilation, large refrigerating rooms, hospitals, baths, etc. The launch took place in fine weather and a large and distinguished company assembled to witness the proceedings, amongst whom were Mr. Rowland Hodge, managing director of the Northumberland Shipbuilding Co., Ltd., and Mrs. Hodge, Mr. Joseph Graham, director of the Northumberland Shipbuilding Co., Ltd., and Mrs. Graham, Mr. G. E. Conner, secretary, and Mrs. Conner, Mr. A. A. Embiricos, of London, representing the owners, Mrs. A. A. Embiricos, Mr. George Renwick, M.P., and Mrs. Renwick, Mr. and Mrs. Stephen Furness, Mr. A. Scholefield, the Greek Consul. Representatives were also present from Lloyd's Registry, the Registro Italiano, the Board of Trade, and Messrs. George Clark, Ltd., also Mr. Peter Embiricos, who has looked after the interests of the owners during the building. On leaving the ways the vessel was christened the *Patris* by Mrs. A. A. Embiricos.

Diplomat.—On December 24th, there was launched from the shipyard of Messrs. Cochrane & Sons, shipbuilders, Selby, a handsomely modelled steel screw tug, the principal dimensions being 83 ft. by 17 ft. by 10 ft. 6 in. moulded. The vessel has been built to the order of Mr. T. C. Spink, of Hull, and will be fitted with compound surface-condensing engines by Messrs. Earle's Shipbuilding and Engineering Co., Ltd., of Hull, and is replete with all the latest improvements for this class of vessel. As the vessel left the ways she was gracefully christened the *Diplomat* by Mrs. A. Cochrane, of Selby, after which the company adjourned to the builders' offices, where breakfast was served and the customary toasts given and responded to.

Rouen.—On December 24th, Messrs. Irvine's Shipbuilding and Dry Docks Co., Ltd., West Hartlepool, launched from their harbour dockyard the handsome steel screw steamer *Rouen*, built to the order of Messrs. Furness, Withy & Co., Ltd., West Hartlepool. This vessel is one of the most up-to-date and one of the largest self-trimming colliers afloat, having extremely large hatchways and equipment for rapid loading and discharging and is fitted with a complete installation of electric light, having large clusters at each hatch. The dimensions of the vessel are as follows:—290 ft. by 40 ft. 2 in. by 20 ft. 6½ in., and she is fitted with poop, bridge and topgallant forecastle. She is built to the highest class in British Corporation Registry. Cellular double bottom is fitted throughout, with extra large after-peak tank, thereby considerably immersing the propeller and thus enabling the vessel to make passages in ballast condition without reducing her steaming qualities. The pumping arrangements have been so carried out that the whole of the water ballast can be pumped out in two and a half hours, which enables the vessel to make the port, in a full ballast condition, whilst at the same time she is able to commence loading immediately. She is constructed with bulb angle frames and longitudinal stringers and is sub-divided to give four clear holds. A powerful quick-warping steam windlass is fitted forward for working the cables, and steam-steering gear is fitted amidships with hand-screw gear aft. Accommodation for the captain and officers is arranged in the poop, engineers in houses amidships, crew and firemen in the forecastle. The cabins throughout will be heated with steam and the sanitary, ventilating and lighting arrangements have been effected on the most approved lines. Triple-expansion engines are being supplied and fitted by Messrs. MacColl and Pollock, Sunderland, having cylinders 20½ in., 33 in., 54 in., by 36 in. stroke, two large single-ended boilers 180 lbs. pressure. The christening ceremony was gracefully performed by Miss Rita Purdon, daughter of Mr. A. S. Purdon, managing director for the builders, who named the vessel *Rouen* as she left the ways.

Scomber.—On December 24th, there was launched from the shipyard of Messrs. Cochrane & Sons, shipbuilders, Selby, a handsomely modelled steel screw trawler, the principal dimensions being 130 ft. by 23 ft. by 13 ft. moulded. The vessel has been built to the order of Messrs. The Mount Steam Fishing Co., Ltd., of Fleetwood, and will be fitted with powerful triple-expansion engines by Messrs. C. D. Holmes & Co., Ltd., of Hull, and is replete with all the latest improvements for fishing purposes. As the vessel left the ways she was gracefully christened the *Scomber* by Miss Bryant, of Grimsby, daughter of Mr. J. Bryant, under whose superintendence the vessel has been built, after which the company adjourned to the builder's offices, where breakfast was served and the customary toasts given and responded to.

LAUNCHES—Scotch.

Bellaventure.—On November 23rd, there was launched from the shipbuilding yard of Messrs. David & Wm. Henderson & Co., Ltd., Partick, a handsomely modelled steel screw steamer, which they have built to the order of The Bellaventure SS. Co., Ltd., through their managing owners, Messrs. A. Harvey & Co., St. John's, Newfoundland. This vessel, although when afloat presenting the appearance of the every-day steamer, has some very interesting features, being specially built for the seal fishing industry and is of exceptional strength for forcing her way through the ice. Her owners were the pioneers, three years ago, of this type of vessel, built entirely of steel for their special trade, and so successful was the first vessel that there are now several other vessels presently under construction. The principal dimensions of the vessel are—Length, between perpendiculars, 240 ft.; breadth moulded, 35 ft. 6 in.; depth moulded, 19 ft.; gross tonnage, about 1250 tons. Officers and engineers are berthed amidships, whilest accommodation is fitted in houses on bridge deck for a limited number of passengers. The machinery, which has also been constructed by Messrs. Henderson, consists of triple-expansion engines, having cylinders 22½ in., 37 in., 61 in. dia. by 42 in. stroke, two single-ended boilers having a working pressure of 200 lbs. The steamer throughout is replete with everything that can add to economical working, and has been built from the specifications and under the supervision of Mr. Louis Findlay, consulting engineer, Glasgow. On leaving the ways she was gracefully named *Bellaventure* by Miss Donaldson, Dunkyan, Killearn.

Dredger.—On November 25th, Messrs. Wm. Simons and Co., Ltd., Renfrew, launched from their yard, complete and ready for work, a twin-screw Simons' patent suction dredger for India. This vessel is fitted with two sets of independent compound surface condensing engines for driving the propellers, and one set of independent engines for driving the sand suction pump, arranged to load the hopper while the vessel is being steamed slowly ahead. The suction pipe, led through a central stern well is controlled by an independent hoist gear. Steam is obtained from a mild steel boiler of ample capacity for supplying steam at full work. Simons' patent arrangements are also provided for discharging the dredgings contained in the hopper over the side of the dredger for reclamation purposes.

Bonaventure.—On December 5th, Messrs. Napier and Miller, Ltd., launched from their yard at Old Kilpatrick the steel screw steamer *Bonaventure*, built by them to the order of the Bonaventure Steamship Co., Ltd. The vessel's dimensions are;—Length, 240 ft. b.p. by 35 ft. 6 in. breadth moulded by 19 ft. moulded depth, with a deadweight carrying capacity of about 1300 tons. The vessel, which has been constructed to Lloyd's highest class, is specially strengthened to withstand the heavy strains caused when forcing her way through ice, and is being fitted up in the latest and most approved style by the builders as a first-class cargo vessel. A very complete system of ventilation to the holds is being provided to enable fruit cargoes to be carried. The machinery is being supplied by Messrs. D. Rowan & Co., and consists of triple-expansion engines 22½ in., 37 in., 61 in. with 42 in. stroke, also two main boilers and an auxiliary boiler. The vessel while being constructed has been under the direction of Mr. Louis Findlay, Glasgow. The naming ceremony was gracefully performed by Mrs. W. C. Donaldson, of Glasgow.

Bruxellesville.—On December 8th, there was launched from the yard of Messrs. Alex. Stephen & Sons, Ltd., Linthouse, a twin-screw passenger and cargo steamer for the Compagnie Belge Maritime du Congo. Her dimensions are: Length, 400 ft.; breadth, 52 ft.; and depth, 36 ft., and her machinery, also constructed by the builders, is designed to maintain a high speed on service. She has been built under the rules of the British Corporation, and will carry a large number of passengers, as well as a considerable weight of cargo, on a limited draught. The vessel was named *Bruxel-*

lesville by Miss Gray, daughter of Colonel Gray, of Nunraw, Haddingtonshire.

Flying Cormorant.—On December 5th, there was launched from the yard of Messrs. Ferguson Bros., Port Glasgow, the powerful screw tug steamer *Flying Cormorant* to the order of the Clyde Shipping Co., Glasgow. The vessel, which was launched with all machinery fitted on board, is the second of two the builders have on hand for the same company, and is the sixth tug boat the Ferguson firm have built for the same owners. The two latest tugs, which are 115 ft. long between perpendiculars, by 23 ft. 6 in. moulded, by 12 ft. 6 in., are specially constructed for towing on the Clyde and are fitted with all the latest improvements for their work. The main engines are of the compound two-crank type, steam being supplied by a cylindrical return tube boiler 15 ft. diameter. Muir & Caldwell steam steering gear is fitted in the after end of engine-room, controlling gear being situate on the bridge. Weir's pumps and heater and Drysdale's centrifugal pumps are fitted in engine-room, and electric light throughout the vessel. The naming ceremony was performed by Mrs. Cuthbert, wife of Mr. William Cuthbert, of the Clyde Shipping Co., Ltd.

Agnes Ellen.—On November 24th, there was launched at Bowling by Messrs. Scott & Sons, a coasting steamer of 300 tons, built to the order of Messrs. James Henry Monks, Ltd., Preston. Messrs. Ross & Duncan, Govan, will supply the machinery. The vessel was named *Agnes Ellen* by Mrs. James H. Monks, Preston.

Keryado.—On November 24th, there was launched by Messrs. Hall, Russell & Co., Ltd., a steel screw trawler named *Keryado*, built to the order of La Société Anonyme des Chalutiers de l'Ouest, St. Nazaire. The vessel will take the highest class in Bureau Veritas Register, and is of the following dimensions :—Length, b.p., 112 ft ; breadth, 21 ft. 6 in. ; and depth, 12 ft. 6 in. A steel boiler and triple-expansion engines will be supplied and fitted by the builders.

Merimbula.—On November 25th, there was launched at Troon by The Ailsa Shipbuilding Co., the twin-screw steamer *Merimbula*, equipped as a first-class pssenger and cargo steamer, and specially intended for the Australian coasting trade of the Illawarra and South Coast Steam Navigation Co., Ltd., Sydney, N.S.W. The dimensions of the vessel are as follows :—Length, 210 ft. ; breadth, 32 ft. ; depth, 14 ft. 6 in. moulded to main deck and 22 ft. to awning deck. She is built to the highest class of the British Corporation Registry, and will have accommodation for eighty first-class and twenty-two second-class passengers. Mrs. Arthur MacCubbin, wife of the superintendent engineer, named the vessel.

Swallow.—On December 10th, there was launched at Renfrew by Messrs. Wm. Simons & Co., Ltd., the first of three special service steamers which they are constructing to the order of the Rangoon Port Commissioners. The vessel was named the *Swallow* by Miss Buchanan, daughter of Mr. Geo. C. Buchanan, chairman and chief engineer of the Rangoon Port Commissioners. The *Swallow* and her sister ships are each of 1000 tons deadweight carrying capacity, and are specially designed for carrying stones and rubble across the Gulf of Martaban to Rangoon in connection with the formation of retaining walls, etc., at the latter port. The propelling machinery consists of one set of triple-expansion surface-condensing engines and large multitubular high-pressure boilers designed for burning inferior coal and capable of supplying the engines with steam for a speed of 10 knots. The construction of the vessel, which is classed at Lloyd's, has been carried out under the direction of Messrs. P. W. and C. S. Meik, London, assisted by Mr. Robert Anderson, resident inspector.

Victoria de Larrinaga.—On December 10th, there was launched at Port Glasgow by Messrs. Russell & Co, the steamer *Victoria de Larrinaga*, built to the order of Messrs. Larrinaga & Co., Liverpool. The vessel, which has been constructed to the highest class at Lloyd's, is of the shelter-deck type, and has a deadweight carrying capacity of 8500 tons on Board of Trade summer freeboard. Her dimensions are :—Length, 405 ft. ; breadth, 52 ft. ; depth moulded, 28·6 ft.

Cormoran.—On December 10th, there was launched at Govan by Messrs. Mackie & Thomson, the steam trawler *Cormoran*, which they have built for Mons. Albert Brière, Bordeaux. The vessel is 120 ft. in length, 21 ft. 6 in. in breadth, 12 ft. 6 in. in depth, and of 237 tons gross. Mr. W. V. V. Lidgerwood, Coatbridge, will supply triple-expansion engines, having cylinders 12½ in., 20 in. and 33 in. diameter respectively and a stroke of 23 in. The *Cormoran*, which will have a speed of about 10½ knots, is of the most modern type of trawler. The naming ceremony was performed by Miss Brown, of Nelson, New Zealand.

LAUNCH—Irish.

Megantic.—On December 10th, the fine twin-screw steamer *Megantic* was launched by Messrs. Harland & Wolff, Ltd., Belfast. The new vessel is a sister ship to the *Laurentic*, which was launched last September, and which, it is expected, will be completed early next year. Although a similar ship to the *Laurentic* in every other respect, the *Megantic* is a twin-screw, whereas the *Laurentic* is a triple-screw steamer, consequently these vessels, although exactly similar in their appointments, will each represent a distinct principle in marine propulsion. The *Megantic* will stand for the highest perfection of the twin-screw "balanced" reciprocating engine, while in the *Laurentic* the combination of reciprocating engines and low-pressure turbine has been introduced. Special interest is being manifested in these two vessels, as they will signalize the entry of the White Star Line into the Canadian trade, a development to which those interested in the trade between the mother country and the Dominion are eagerly looking forward, anticipating that the successful achievements of this well-known company in the New York and other important trades will be repeated on the St. Lawrence route. Probably in no part of the Empire is there greater industrial and commercial enterprise at present than in Canada, and the new connection so soon to be inaugurated by the White Star Line is bound to give a great stimulus to the spirit of enterprise, thus tending to still further strengthen those ties which "light as air but strong as iron," bind the colonies to the mother country. The *Megantic* and *Laurentic* will be the largest vessels in the Canadian trade, being 565 ft. long by 67 ft. 4 in. beam, and about 15,000 tons gross. They are designed to carry a large quantity of cargo, also a full complement of passengers—about 260 first-class, 430 second-class and over 1000 third-class. Needless to say, the *Megantic* will be, like all the other vessels of the White Star Line, designed and built on the most approved principles, nothing that long experience and practical knowledge can suggest being wanting to make her as perfect as possible in construction, arrangement and appointments. She has been built on the cellular double-bottom principle, the double bottom extending the whole length of the ship, and specially strengthened under the engines to give still greater rigidity in the vicinity of the machinery. The vessel has nine water-tight bulkheads, dividing her into ten water-tight compartments. As, of course, is well known, the double bottom, in addition to being an element of strength and security, provides space for water ballast, which is also carried in the fore and after peaks. The arrangements for cargo are of the most approved kind. There are six cargo holds, and the bunkers are specially arranged to facilitate the coaling. Messrs. Wailes, Dove & Co.'s bitumastic covering was applied to the tank top in boiler space and flat of deck in refrigerating space. Those who witnessed the launched were much struck with the handsome lines of the vessel, and when complete the *Megantic* will have a very fine appearance. The derricks and other appliances for working the ship and cargo are of the latest pattern, special attention being paid in the design of the vessel to the requirements of shippers in the Canadian trade, and the vessel will have large refrigerated chambers, both for provisions and cargo. The passenger accommodation in the new vessel has been carefully arranged on the most generous principle, and it is confidently expected that the *Megantic*, like the *Laurentic*, will prove a great favourite. Added to the good sea-going qualities of the vessel the accommodation will be of the most comfortable and pleasing character. A feature of the entrances and public rooms will be their height and general roominess, and the state rooms will have the same characteristic. The decorations will also be of a truly artistic character, realizing the ideal of the artist—richness and simplicity combined. The first-class state-rooms

will be [illegible] deck house on the lower promenade deck [illegible] on the shelter deck. There will be a number of [illegible] *-à-te* with private lavatory and bath room adjoining each suite. The first-class saloon on the middle deck will be a very handsome room, panelled and framed, finished flat white, relieved with elaborate carving. The dado and furniture will be in oak, and the floor parquetry. The saloon extends the whole length of the vessel and will have seating accommodation for 160. It will have the popular "well" arrangement overhead, with verandah for the bandstand. The first-class lounge on the upper promenade deck will be in Louis XV. style, artistically panelled in oak with parquetry floor. The reading-room on the same deck will be in white, in the style after Adam Bros. This room will also have a parquetry floor. The first-class smoke-room on the upper promenade deck will be decorated with embossed leather and handsomely carved framework round the windows. The furniture will be of mahogany, and the floor india-rubber tiles. There is an electric passenger elevator serving four decks. The second-class state-rooms are on the shelter deck; the saloon on the middle deck—a very fine apartment extending the whole width of the ship—is to seat 262. The second-class library is on the lower promenade deck, and the smoke-room on the upper promenade deck—both elegant apartments, tastefully decorated in polished hardwood. The second-class passengers on this vessel will find the provision made for their comfort second to none on the Atlantic. The third-class dining-room, which is aft on the upper deck, is also an exceptionally good room, extending the whole width of the ship. The promenading spaces on this vessel will form a special attraction, the fullest advantage being taken of the vessel's size to provide the pleasurable recreation so much enjoyed by Atlantic voyagers. The vessel will be fitted up with the latest and most improved Marconi system of wireless telegraphy, and will also have a submarine signalling apparatus.

TRIAL TRIPS.

Arthur.—On November 21st, the handsome steel screw steamer *Arthur* (of which we gave particulars in our December issue, page 174), built by Irvine's Shipbuilding and Dry Docks Co., Ltd., at their harbour dockyard, and built for the Rederiaktiebolaget "Lizzie" of Landakrona, proceeded to sea on her trial trip. The ship and engines gave every satisfaction to the owners' representatives, a mean speed of 10 knots having been attained on the runs.

Stamboul.—On November 23rd, the fine steel screw steamer *Stamboul* (of which we gave particulars in our November issue, page 134), built by Messrs. Wood, Skinner & Co., Ltd., Bill-Quay-on-Tyne, to the order of Mr. O. Thoresen, of Norway, left the Tyne for her official trial trip. The machinery, which has been constructed and fitted at the Northumberland Engine Works, Wallsend-on-Tyne, of Messrs. The North-Eastern Marine Engineering Co., Ltd., consists of a set of their latest type of triple-expansion engines, having cylinders 23 in., $37\frac{1}{2}$ in., $61\frac{1}{2}$ in. with a stroke of 39 in., steam being supplied by two large steel boilers, working at a high pressure. During the trial run very heavy weather was experienced, but despite this fact the machinery ran without a hitch, and maintained a good speed. Amongst those present were Mr. Thoresen, owner, Mr. Conradi, under whose supervision both hull and machinery have been constructed, Mr. Leslie Skinner, representing the shipbuilders Mr. J. Daglish, representing the engine builders.

Navarra.—On November 28th, the steamship *Navarra* (of which we gave particulars in our December issue, page 174), built by Messrs. Robert Thompson & Sons, Ltd., at their Southwick Yard, and engined by Messrs. The North-Eastern Marine Engineering Co., Ltd., of Sunderland, had a very successful fully-loaded trial trip, the contract speed being exceeded. The owners' representative expressed himself highly satisfied with both vessel and machinery.

Harvey Scott.—On December 4th, the screw steamer *Harvey Scott* (of which we gave particulars in our December issue, page 175), built by The Blyth Shipbuilding and Dry Docks Co., Ltd., for Messrs. The Harvey Scott Steam Ship Co., Ltd. (Messrs. John O. Scott & Co., Newcastle-on-Tyne, managers), was taken to sea for trial. Triple-expansion engines of good power have been fitted by Messrs. North-Eastern Marine Engineering Co., Ltd., Sunderland, cylinders 19 in., 31 in., and 51 in. by 36 in. stroke, working at 180 lbs. pressure. The vessel is fitted with a Cochran (Annan) donkey boiler. The representatives of owners, builders and engineers on board were highly satisfied with the performance of both ship and machinery, good results being obtained. The hull and machinery have been built under the supervision of Mr. Norman Burnett, of Newcastle-on-Tyne.

Gascony.—On December 12th, the steamer *Gascony*, built by Messrs. R. Craggs & Sons, Ltd., Tees Dockyard, Middlesbrough, for Messrs. David MacIver Sons & Co., Ltd., of Liverpool, concluded her trial run. The vessel (of which we give particulars in this issue) left the builders' hands, and after taking in about 1600 tons of bunkers in the Middlesbrough Docks, sailed for Liverpool, at daylight on December 13th. She arrived safely at her destination on the following Wednesday after a highly satisfactory run. Everything worked smoothly, and in spite of the terrible weather experienced in the Channel the vessel maintained an average speed of over 10 knots.

Queensgarth.—On December 15th, the fine steel screw cargo steamer *Queensgarth* (of which we gave particulars in our December issue, page 174), built by Sir Raylton Dixon and Co., Ltd., Middlesbrough-on-Tees, on the well-known patent cantilever framed system with top-side water ballast tanks, proceeded to sea for her official trials. She has been constructed to the order of Messrs. Rea Shipping Co., Ltd., of Liverpool, Cardiff and Southampton, and is the third of this type built at the Cleveland Dockyard to fulfil the special requirements of the owners' extensive coal carrying trade. The trials passed off most successfully and the vessel proceeded to Hull to load under the command of Catpain Armstrong. The hull and engines have been constructed under tue supervision of Mr. H. W. L. Shubrook, the owners' superintendent engineer, assisted by Mr. W. H. Hawson.

Bellaventure.—On December 18th, the steel screw steamer *Bellaventure* (of which we give particulars in this issue), built by Messrs. David & William Henderson & Co., Ltd., Partick, Glasgow, for the Bellaventure S.S. Co., Ltd. (Messrs. A. Harvey & Co., managers), of St. John's, Newfoundland, underwent her trials on the Firth of Clyde. Everything passed off satisfactorily, the vessel easily attaining a mean speed of $13\frac{1}{2}$ knots.

Kapunda.—On December 19th, the handsome steel screw steamer *Kapunda* (of which we gave particulars in our December issue, page 175), built by Messrs. W. Gray & Co., Ltd., West Hartlepool, to the order of Messrs. The Melbourne Steamship Co., Ltd., Melbourne, was taken for her trial trip. This is the fourth steamer built by Messrs. W. Gray & Co., Ltd., for this well-known firm. The vessel and her machinery have been built under the superintendence of Messrs. J. H. Hallett, Pattison & Co., Cardiff. Mr. Hallett attended the trial on behalf of the owners and Captain J. J. Leask was in command; Captain J. E. Murrell represented the shipbuilders and Mr. Maurice S. Gibb the engine builders. The average speed registered by the log was $13\frac{1}{2}$ knots, the maximum being 14 knots, loaded ship. The trial was a very satisfactory one, and the vessel on its completion proceeded on her voyage to Australia.

Remus.—On November 23rd, the new steamer *Remus*, built by Messrs. John Fullerton & Co., Paisley, for Mr. G. B. Wadsworth, Goole, ran trials on the Firth of Clyde. When fully loaded, with 1500 tons deadweight on board, the vessel attained a speed of 10·8 knots, which was considered highly satisfactory. The *Remus* is one of the largest steamers ever built on the Cart.

North Western.—On November 28th, the grab dredger *North Western*, built by Messrs. Ferguson Brothers for the London and North-Western Railway Co., left the Clyde for the Mersey. On November 24th the vessel's dredging machinery was tested at Port Glasgow, and in loaded trim she was put through steam trials on the Gareloch. The *North Western*, it is understood, is to be employed at the Garston Dock, Liverpool.

The Marine Engineer
And Naval Architect.
LONDON, FEBRUARY 1, 1909.

NAVY SHIPBUILDING.

IT is possible that before the March issue of the Marine Engineer is in the hands of our readers all doubt will have been set at rest with regard to the Navy Estimates of 1909-10. It is almost unnecessary to say that the country—indeed, the Empire—awaits with anxiety the announcement of the shipbuilding programme. There are two main causes for this attitude, one transcending the other in importance, although the minor point has a very large interest for all concerned in marine engineering and its allied industries. There must be no further delay in making the necessary provision for insuring the maintenance of our naval strength. The gravity of the situation has been manifested on the platform and in the Press in innumerable speeches and articles. At the same time the measures taken in this direction will afford very welcome relief to the shipbuilders and manufacturers of war material and the multitudes of workpeople and others dependent upon a steady demand for the output of their establishments. So far as plain statements are concerned there should be no cause for apprehension, since the Prime Minister has accepted a formula which declares that the standard of naval strength to be maintained by this country shall be represented by a preponderance of ten per cent. over the combined strength of capital ships of the two next strongest Powers, "whatever they may be and wherever they be situated." The only possible ambiguity about this statement is to be found in the phrase "capital ships," which has been substituted for the words originally used by Lord George Hamilton. The explanation of this change in terms is doubtless to be found in the recent construction of the *Invincible* class of armoured cruisers, vessels which may be used at will in the line of battle or for the protection of commerce. Practically there is no ambiguity, because, if our armoured cruisers are to be included, all corresponding ships belonging to other Powers must be reckoned in the same category. The only question, then, concerns the provision which should be made in the forthcoming Estimates for the maintenance of the standard thus defined.

There can be, moreover, very little doubt about the reply that should be given to this question. Fortunately, the two next strongest Powers have both of them fixed by law the minimum number of capital ships to be laid down each year for some time to come. Germany will make provision for the addition of four such ships and the United States two. If, then, we were merely on terms of equality with these two navies, six vessels would be sufficient to maintain the equilibrium. As a matter of fact, we possess in the older vessels a considerable superiority over the older vessels of these two next strongest Powers. While, therefore, those older vessels remain effective, which will be the case for some few years to come, it will be sufficient to build to exactly the same extent, so far as capital ships are concerned, the same number as the two next strongest Powers. But numbers alone are not sufficient if an adequate measure of security is to be obtained. Sufficient money must be voted and the orders placed promptly, so that the vessels may be delivered in the shortest possible time compatible with economy and efficiency. Furthermore, to the capital ships must be added the necessary adjuncts, cruisers and small craft, guns and torpedoes, and a reserve of all the essential elements of fighting power. The necessary provision of all these things cannot be longer delayed. The country will not permit the Government to shirk its responsibilities in this matter of national protection. Neither the pacifists for sentimental reasons, nor the financial purists who object on principle to loans, can be permitted to raise obstacles. Whatever money is necessary must be found, and Mr. Asquith's promise converted into performance. This is the last word of the nation; and that as a result there must be a large increase of work for the shipbuilders and gun manufacturers, and others who supply the elements of naval efficiency, will be a direct benefit to the most important of our home industries.

THE ROLLING OF STEAMSHIPS.

IT has been said that the rolling at sea of the two steamships *Lusitania* and *Mauretania* is much beyond what could have been expected of them. It is a pity that two boats of such an extra size should prove so deficient in steadiness as regards a cross-sea that they would seem to be either badly designed, or badly placed as regards their deadweights as to make them roll excessively. Sir G. Greenhill has given a good analysis of the motion of the *Lusitania*, and shows graphically by diagram how the motion, which is equivalent to that of a pendulum, may be calculated. As he points out, at the centre of gravity, which is a long way down in the ship, the motion is least, whilst as regards the flying bridge the velocity of the motion there is so great that a body standing there would be left behind in the air if not lashed down. To a sailor up in the crow's-nest on the mast the motion would be still more violent. The length of 800 feet is calculated in these ships to ride easily over two waves of the magnitude likely to be encountered. But no beam can be made so large as to extend over more than a fraction of wave length, and thus ease of motion in rolling must be secured by

attention to proper metacentric height at the start; and, further, throughout the voyage, owing to the coal burning out, as a few inches in metacentric height will make all the difference in comfort and safety. If the stiffness of the ship is to be maintained during the voyage, a theorem of naval architecture asserts that the depth of the centre of gravity of the coal below the water-line should be equal to the metacentric height. The centre of gravity of the bunker capacity should lie in the mean water-line of light and load draught at the beginning and end of a voyage. The two conditions are practically equivalent. But we think that the design of these vessels has been restricted by the comparatively shallow draught that was determined by the owners not to exceed 35 feet owing to the limitation of docking accommodation. The owners' ideal was merely an attractive total, steady in all but the severest weather. The designer had to approximate to this within the limits laid down, and he has failed to arrive at this ideal. On the maximum draught allowed, with a flat rectangular hull, all the displacement is crammed as much as possible into the centre of the ship; the ends for a long way from the extremities are little more than vertical walls with large and heavy copings. An old sailor has much prejudice against these flat-bottomed boats, and credits them with an exceptional power of rolling with some justification, as seen by these examples. A craft with a form like a can buoy stuck between the big ends of two sharp wedges is a form of construction which serves to make such a ship specially liable to roll and tumble about in a heavy sea. Of course, such a vessel had to be fine for her high speed, but she is a large ship and comparatively easy to drive. We might compare her with fast ships of much smaller size. By Froude's Law of Comparison an enlarged *Ulster* 763 feet long of 88 feet beam and 30 feet 9 inches draught, or 3 feet longer than the *Lusitania*, with the same beam and about her draught on arrival, would be as suitable for 34 knots as the *Ulster* is for 23·5 knots. This is an enormous excess over the expected sea-speed of the *Lusitania*, and would permit a large increase in displacement and block co-efficient. There is an increase, of course, but prudence would dictate that that increase should have been as large as possible, and so distributed as to secure the fine seaworthy qualities of the slower and fuller-lined ship. Beside the fineness and form of the hull there is the question of the distribution of weight. In the *Lusitania*, instead of the main deadweights being distributed so that they might be placed as far as possible apart from the centre-line, somewhat equivalent to the balance weights used by a tight-rope walker, the main permanent weights, such as the boilers and water, low-pressure and reversing turbines and condensers, extend over a very large proportion of the length of the ship, and are concentrated as near to the centre-line of the ship as possible. Therefore, instead of using these weights as a balancing pole to steady the ship, they are used as a pendulum weight to keep her swinging. It must be remembered that as the coal is used up on the voyage her roll gets longer and slower. The height of freeboard as regards her draught, due to her upper works being built up for the upper accommodation of passengers, has made a form of hull which gives her every tendency to act as a pendulum in a seaway. We must remember that steadiness in these ships with their wing propellers is all-important. The driving power of these wing propellers may be entirely effected as to whether these propellers are constantly immersed, or whether by the rolling they gradually change from the stream which they have already got into motion rearwards to fresh water, in which they have again to commence setting in motion a fresh stream. They must lose much time in wasting efforts in setting such new stream into motion, during which they are not driving the ship. Many occasions have taken place in which the *Lusitania* and *Mauretania* have run home before a following sea with every opportunity of making rapid passages, but in each of such cases the result has been disappointing. The ships evidently roll in an excessive manner before such a following sea, with the natural result that the wing screws are little more than useless.

THE GAS ENGINE AND PRODUCER PLANT FOR MARINE WORK.

MUCH interest has been displayed for some time past in the utilization of the gas engine and producer plant for the purposes of marine propulsion, and, in spite of the proved efficiency of this type of power-generator on land, a certain amount of reluctance appears to exist among marine engine builders and shipbuilders in giving due weight to the merits of the system for ship purposes. An interesting paper was read recently by Mr. E. Shackleton on "The Gas Engine and Producer Plant and its Adaptability for Marine Work," before the Institute of Marine Engineers. The author dealt fully with the chief objections to such a plant from the marine engineer's point of view under the following heads:—Inability to reverse, unreliability, pre-ignitions and back fires, difficulty in starting, accumulations of dirt and carbon in cylinders and pistons, and poisonous gas from leakage in gas plant. In every case a reasonable solution is put forward, and, with the exception of the electrical drive in dealing with the matter of reverse, each solution has practical work and experience as its basis. In the examples given of the comparative cost of gas with steam the figures were somewhat remarkable, as for propelling purposes the fuel consumption would be only half for gas for that required for steam for the same power and one-fifth for stand-by losses, while for cargo discharge the gas

plant with electrical winches would only consume one-fifth of the fuel. From the shipowner's point of view, quite apart from the question of the fuel saved, considerable cargo-space economy can be shown, and the author is of opinion that a well-designed steamer of about 1200 I.H.P. fitted with gas plant could show a profit of £1,000 over and above the steam-fitted vessel per voyage, irrespective of less labour costs, coaling time saved and cargo-discharging fuel economy. We think it will be generally recognised that the moderate-power gas-boat will take its place in the marine world at an early date, as a well-constructed gas engine, intelligently looked after, will do periods of running that would not be credited unless actually seen. Apparently, as it is not so much a question of building a gas-driven ship as inducing owners to leave the beaten track and pay a fair price for such a vessel, it is sincerely to be hoped that at no distant date the advantages claimed for the gas engine will be demonstrated on a substantial scale.

THE PRESERVATION OF WOOD.

CONSIDERABLE attention has been aroused during the past few months especially, in connection with the decay of wood used for insulating purposes in the holds of steamers fitted with refrigerating plant. The subject is also of importance in other branches of trade; in the manufacture of paper, for instance, close investigation is now in progress with a view to discover the cause or causes of a species of decay which seriously affects the manufacture of paper from the wood pulp. At the Congress of the Refrigerating Industries held in Paris, the subject of the preservation of wood was dealt with in a paper and discussion, and at the Institute of Marine Engineers, a paper by Mr. Dyer was read and discussed; on both occasions the desirability of having wood treated by a process in order to its preservation under adverse conditions, was strongly urged, with the proviso that the process should not render the wood unfit for service in the carriage of food, delicate fruit or dairy produce.

Our attention has been called to a patent process termed "burnettising," which is claimed to serve all the purposes and requirements of engineers for the wood used in construction, and in holding and binding insulating material, and preserving it from decay. The process was named after Sir William Burnett (Director-General, Medical Department, Royal Navy), and has been used for preserving and rendering less inflammable the timber used by the Admiralty, by Dock and Harbour authorities. The process consists of placing the timber, after being cut to the required scantlings, in steel air-tight cylinders. After the wood is placed in the cylinder, the door is closed and a vacuum pump is then put into action to extract all the air and moisture. When this is done, a valve on the cylinder is opened and the preservative is drawn in, until it entirely fills the void in the cylinder. The preservative is then pumped into the cylinder under pressure; as the pressure increases the preservative enters the timber and fills up the pores which formerly held sap or moisture until the whole is permeated with the preservative and the process is completed. The results are such that the wood is hardened and improved in texture and no amount of washing in water will remove the chemical compound; it is rendered impervious to wet or dry rot; it is rendered uninflammable; it is preserved from animal and vegetable parasites, also from the attack of the white ant and other insects; it is not discoloured and will take on paint or varnish as well as similar wood untreated, and iron or other metal in contact with or embedded into the treated wood is not oxidized. The process can be applied to wood in any stage, whether green or seasoned, wet or dry. The preserved timber is odourless and innocuous.

THE WEAR AND TEAR OF MACHINERY.*

By MR. W. R. AUSTIN.

MY subject is one of interest to all connected with the design or management of machinery. The designer wishes to know the weak points so that he may amend the error of his ways, while the practical man wishes to broaden his experience by the acquisition of facts which will assist him in the discharge of his daily work. It was in the hope that I might be able to place before you a few notes of interest that I consented to read this paper, but perhaps my experience as shown herein may be but commonplace.

You will doubtless say that my subject requires some definition. Wear and tear was the title usually applied to the normal wear of the working parts of an engine; but as insurance policies were extended to include acts of negligence it has lost to some extent its old-time meaning. Repairs, the cost of which were at one time borne by the owner, may now fall (on account of this negligence clause) under claims of damage, and are therefore paid by the underwriter, provided the loss incurred amounts to more than 3 per cent. of the insured value of the machinery.

I will deal with the subject from this wider aspect. Viewing it from this standpoint, I found some difficulty in selecting what would prove of interest, and I have, therefore, decided to confine myself to a few of the points bearing on wear and tear; and then refer more particularly to cases where some of the principal parts of an engine have required renewal from various causes.

It will be evident that there are three factors which have a direct bearing on my subject. These are material, design and workmanship; and if these were at all times perfect wear and tear would be brought almost to an irreducible minimum, and there would be little use for that much-abused individual, the surveyor, who seems only to justify his existence by striving to attain that perfection of work which, could it be reached, would render his existence as such almost unnecessary.

In briefly referring to those considerations let me say that specific cases are excluded. In such instances the purpose for which intended, the trade and the space in the vessel may each or all have a bearing on the design, and lead to arrangements which under other circumstances would not be adopted. Design will, therefore, be accepted as referring to ordinary types.

Let me first refer to material. The better it is the less is the risk of failure, and wear and tear are correspondingly reduced. If we take the case of an iron shaft, it is almost impossible, in building it from common scrap, to get it free from flaws. This arises from the difficulty of cleaning the scrap even with the best appliances. On the other hand, if rolled bar iron is used in the manufacture, you obtain a shaft which if it has not the uniformity of structure or homogeneity of steel, is more fibrous and less liable to the failures which arise from the combined actions of fatigue and corrosion in sea water. Lockfast iron has been much used in the manufacture of screw shafts, but the name is purely a commercial definition. Most people know that the small prominences visible on a rolled bar when cold—and from which the name is derived—are the first parts that disappear when the iron is subjected to a welding heat, and even before work is put on the material they lose their individuality. Hence my reason for saying the name is a commercial one. Still the fact remains that great care is taken in selecting the material, and shafts made from such iron prove this by their greater durability.

Ingot steel is now made of such uniform quality that it can be obtained of a thoroughly reliable nature up to a tensile strength of 35 tons per square inch for the manufacture of any forging required in a marine engine.

Scrap steel has proved unsatisfactory when used for forgings. This seems to arise from the varying constituents. Chemical analysis may reveal only a small percentage of variation in two samples, and they may be welded; yet the welding process is unreliable in a mass. When the

* Read before the Greenock Institution of Engineers and Shipbuilders at Greenock on December 10th, 1908.

point is considered this is what may be expected. In dealing with a heterogeneous mass of scrap, the pieces varying from 26 to 32 tons per square inch in tensile strength and correspondingly in chemical analysis, it is scarcely reasonable to look for a homogeneous shaft. Even if a shaft is produced that is apparently sound, when put to its work there are parts of its structure stronger and less yielding than others. While the shaft may even seem homogeneous in appearance it is really heterogeneous in structure. After a time defects show upon its surface and these have led, in the past, to the condemnation of a number of shafts made from this material.

Cast iron is sometimes supplied of such a quality that the wear on cylinder liners, cylinder faces, etc., is excessive, but on the whole this material gives less trouble than any other used in the working parts of an engine. This arises from the fact that engineers and ironfounders know exactly the mixture best suited to give a good result for any particular purpose. Where excessive wear occurs with this material the cause may not be altogether due to the nature of the metal. In many cases it has been traced back to an error of adjustment, or some neglect on the part of the engineer in charge.

In the case of bronze and white metal it is now considered antiquated to fit the former to main bearing or crank pins, its working capabilities being much inferior to white metal of fair quality. This excellence of white metal over bronze arises from the fact that it accommodates itself more readily to the working surface, and under ordinary working conditions it obtains for itself a much better contact with the shaft than you get from bronze. Both metals are readily affected by temperature, but bronze is more easily distorted, and a very slight twist due to overheating may be the precursor of a lot of trouble, in which the bronze will crack. The co-efficient of expansion is in favour of white metal, and yet it seems less liable to seize if it gets warm. Should this occur it is more readily adjusted. Apart altogether from the question of opinion experience has proved the good qualities of the white metal, and it has ousted bronze from the position it once held in the opinion of engineers.

The second factor, *viz.*, design, has a direct bearing on my subject. Assuming that you have adopted standard proportions for the working parts of your engine, then the principal element required to make a design successful is accessibility. If any working part is not easy of access, neither the best of materials nor workmanship can save it, as it will be neglected and excessive wear will be the result. The bearing surface may be of the best proportions, but forethought in this and other things goes for nothing, as inaccessible parts do not get that attention which they require. Let me add that accessibility applies not only to working parts, but likewise to the means of lubricating those parts. In the smaller sizes of engines this is a point not always fully considered. A means of lubricating which may be sufficient for smooth water becomes inadequate or unsafe in a rough sea way, with the result that some parts are neglected or receive only such lubrication as the water service pipes can supply in conjunction with the syphons. Instances of this kind have been known, and the white metal bushes of the crank pins were ruined in consequence.

The sea is a notoriously unstable platform, and the engine occasionally suffers from stresses set up in the hull from the movement of the vessel. These may be intensified by the careless distribution of heavy cargoes when loading, and this movement produced in the structure of the ships is communicated to the working parts of the engine. It may not be much, still, however slight, it affects the journals and causes them to work warm. This is the one condition affecting the machinery over which the engineer, as a designer, has no control. If all the working parts are accessible the difficulty can generally be overcome by extra attention while working under such circumstances.

Coming to the third factor, *viz.*, workmanship, I do not feel that I am called on to say much. Years ago, when the major portion of the fitting was done by hand, there was undoubtedly room for improvement, but with the advent of splendid tools—when well nigh every part is turned out practically finished—there is not the same scope for bad work. If the cylinders, shafting and pumps are properly placed in line, and stationary parts receive equal attention, [illegible] little ground for complaints from wear and tear under this head.

There are, however, other points to which I would refer here. We may have excellent materials, design and workmanship, yet the responsibility of getting a job to do it, work well lies to a great extent with the engineer in charge. His errors of management, no less than his errors of neglects are occasionally lost sight of by some trivial defect in the considerations I have mentioned. A careless man scruples not to make such a defect a shield for his own negligence. This human element affects all jobs alike, and in its many and varied failings is more responsible for wear and tear than bad design, workmanship or material. The man who takes a watch at sea should be thoroughly fit from a physical point. He should have had a good practical and theoretical training, and when he takes up his position as junior on board he should be taught to go about his work methodically and systematically. He should be able to look ahead. Many of the accidents which occur at sea are brought about by neglect of duty in port. An instance of this is found in the engineer who never cleans his bilges until the strums are found choked at sea. He thereby gives himself a large amount of unnecessary work—work which may in bad weather endanger the ship—and in the doing of which on watch he neglects the working parts of the engine, which suffers in consequence. Above all, the engineer on duty should be alert and active. Such a one as is found leaning oft against the bulkhead or sitting down should be left at home. Dozy men in such a position are a source of danger. Men with the qualities and training first mentioned are generally successful in the management of the engine-room, and under their care the cost of repairs is low.

On the other hand, restrictions are sometimes placed on the engineer. He may be tied down to a given consumption of oil per day (not, of course, for personal use, an engineer's taste does not generally lean that way). If he exceeds this to any extent he is called on to explain, and I have known instances where the restrictions of this kind made the life of the engineer on watch anything but a happy one. Heat showing on a bearing is a sure sign of undue friction, and if it is not overcome at once it will lead to excessive wear.

Under restriction not to exceed a stated quantity of oil per day he tries his best not to exceed it, and frequently in his effort to keep within the limits laid down he applies the water service. This through abrasion and sometimes fusion becomes tenfold more costly to the owner than the oil saved. Efficient lubrication is, therefore, essential if wear and tear are to be kept down, and this can be easily attained if the supply of oil is regular and the quality good.

Another condition to which wear and tear of certain parts is frequently attributed is priming. This occurs in some boilers and generally arises from the existence of one of the following conditions, *viz.*, a very dirty condition of the water; an effort to take out of the boiler more power than it can give, or a faulty design, *viz.*, that of crowding too much heating surface under a given area. Generally speaking, the two latter conditions exist side by side.

Where it results in mud being lifted and drawn through with the steam, the piston rods, slide spindles and glands suffer, and in a much shorter time than usual the neck bushes and gland liners require renewal, while slide valves working under these conditions become grooved on the face and are rendered leaky. If the priming is excessive it almost invariably causes the crank pins and crossheads to work warm, as the hot water is constantly dripping on them and washing out the oil, and as there is in the water a certain amount of sediment, such conditions of working are all in favour of excessive wear of the bushes.

If the cause of priming arises from faulty design it has to be borne, or a sacrifice made of the power. On the other hand, if it arises from the muddy state of the water the difficulty may be got over by changing it.

A case of this nature came under my notice, where the boilers had not been properly cleaned before the water was put in. On the trial of the machinery the priming was excessive, the amount of mud passing with the steam being such that the friction on the M.P. cylinder and piston stopped the engine with a grunt that made you shiver, so jarring was its effect. It was suggested to try scumming the boilers, and when this was done, the highly discoloured state of the water alongside the ship was a "silent yet eloquent" testimony to the internal condition of the boilers. On resuming the trials the speed guaranteed was got with ease.

Priming such as this not only causes wear and tear of the parts I have mentioned, but it is an undeniable fact that engines worked under such conditions are heavy users of packing.

Having referred briefly and generally to some of the conditions affecting the subject, let me now bring before you some particular cases of failure which have come under my notice.

Crank shafts are now generally made—both pins and body pieces—of steel, but it will be within the recollection of many that when these shafts were made from solid iron forgings, failures were much more frequent than at the present time.

Some years ago it was quite an everyday experience to see solid shafts running with circumferential defects close to the crank webs, and a longitudinal flaw or two on the body. The flaws found on the body were traceable to lack of care at the forge, but the circumferential defects had developed as a result of the shaft working slightly out of line.

I would not suggest that the fault lay in the original lining of the shaft. As I have already said, sometimes the loading of the ship caused an alteration of form, more so at the time I refer to than now. Still, this with the wear and tear of bushes caused the defect, and the ultimate result, from whatever cause arising, was that the fractures extended and in time the shaft was condemned.

These cracks might extend for a third of the circumference, and I have seen them go half way round the shaft. At first sight, it may be thought the fractures extended in depth so that only a little more than one-half the cross section of the shaft was available for the purposes of torsion, as shown by the shaded part of Fig. 1. But this is not so, at least in the earlier stages of its existence. In reality a shaft might run for a long time from the commencement of such a defect before it got as deep as here shown. When this point is reached it always strikes off into the web and its renewal is then imperative.

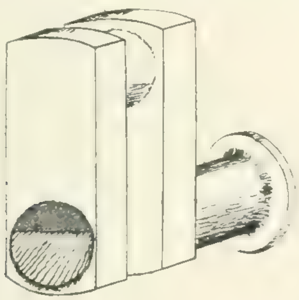


Fig. 1.

These fractures arise from bending stresses arising from the shaft working out of line. To put it in another way, such a crack is the result and represents the sum of an infinite number of bending moments which vary with every corresponding movement of the shaft while in motion. If it was one force acting at one instant only, on the revolution of the crank there the fracture would be as represented in Fig. 1, but being, as I have said, a number of small forces acting continuously as the crank revolves you may have a crack extending a third of the circumference and the extent of the crack, when broken, is as shown at Fig. 2, being only from $\frac{1}{2}$ in. to $\frac{5}{8}$ in. in depth. Nevertheless, we cannot overlook the fact that a stress which can actually fracture the metal so far down into the body of the shaft in cross section must have strained the material adjacent to it beyond its limit of elasticity, and rendered it most unreliable.

I mention the defects in these solid shafts because they are interesting and instructive, and their absence now-a-days emphasizes most distinctly the strides we have made in crank shaft manufacture. There must be many engines working now with the crank shafts slightly out of line. Yet failures in built shafts are, comparatively speaking, rare, and everything goes to show that the usual working stresses which would have necessitated the renewal of a solid shaft are borne by a built one without injury. This arises from the fact that the grip due to the contraction of the crank webs on the body and pins of a well-designed shaft is a force more or less elastic, capable of transmitting the power of the engine (*without* a key or dowell pin), and yet it permits the necessary movement due to mis-alignment without the liability to fatigue. It may not have the ultimate strength of a solid shaft, but it withstands the fatigue which would cause a solid shaft to fail. In a solid shaft the power is transmitted solely through a comparatively rigid *material*; in the case of the built crank shaft (neglecting the key or dowell pin) it is transmitted by what I may call this dormant *force* of contraction.

Occasionally in built crank shafts a pin or body piece may become slack, but, generally speaking, when this happens

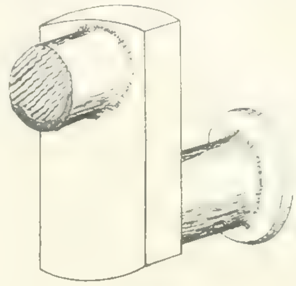


Fig. 2

there is some fault in the manufacture. Still, I have known a sudden shock cause a crank pin to move in the web and thus throw the shaft out of "truth." Such an accident might not have happened had a dowell pin been fitted between the crank pin ends and the webs. The necessity for such is a point on which practice and opinion differs. In this case to which I refer the crank pin was taken out, the webs were re-bored and a new crank pin fitted, after which the shaft was tested for truth in the lathe.

Movement in a crank pin or body piece of a shaft is always noticeable where it exists, by oil, black and thick, exuding from the defective part. If it is on the webs and body it will show at the circumference of the shaft, if on the crank pin at the ends thereof.

A coupling in which bolts are slack in the holes shows the defect in a similar manner, and when this is seen where the coupling faces butt together the conclusion to be drawn is that the bolts require attention. In the case of a tunnel shaft coupling, the indications of slackness bear a more rusty appearance.

I may add that when the bolts in a coupling become slack they cause a knock. Under certain conditions, as going astern or racing in heavy weather, the noise given out is alarming and seems out of proportion to what you would expect for

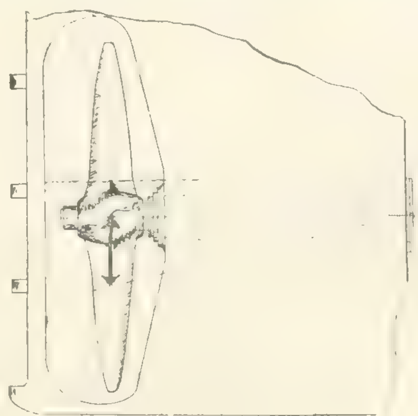


Fig. 3

such a small amount of slack. The first impression conveyed is that the propeller is loose, and if the evidences of slackness are absent and examination does not reveal the seat of the trouble on the shafting or pistons, then the fault probably lies at the propeller.

These instances of slack bolts occasionally damage the holes, and the only remedy is to have them widened and new

bolts fitted, at the same time testing the shaft to see that it is in line.

Propeller shafts in the past more than any other working part of the engine have given trouble, and most frequently required renewal. Where separate brass liners are fitted and the shaft is not carefully lapped between the liners, the trouble is fairly constant and comes to be expected. Fracture in most cases develops at the ends of the brass liners, either close to the propeller or further forward. It penetrates into the shaft in a similar way to that shown on Fig. 2, but, of course, it extends all round the shaft. It is produced by a series of complex stresses arising (1) from the overhang of the propeller, (2) from the slackness of the stern bush, and (3) from the conditions when racing and light, that the centre of effort does not coincide with the centre of the thrust. That is, if the neck bush at the inner end of the stern tube be taken as a fixed point the distance between the centres mentioned may be something approaching three feet, as indicated on Fig. 3.

The varying strains set up by these conditions are all transmitted to the point where the liner forms a step on the shaft, and the stresses coming on this point are aggravated by the action of sea water. If the shaft were running in oil there would probably be no trouble; as it is working in sea water, so soon as it gets rusty the strain cracks the rust scale and exposes a new part of the metal to a repetition of the action. As this goes on continuously the deterioration is rapid, as is evidenced by the large number of shafts which failed within two years of the time they were first fitted, while many others either broke or were condemned before they had accomplished four years' work.

Now that continuous brass liners are more generally fitted failures are less frequent, even in the case of vessels running much in ballast. This seems to indicate that as the bending stresses on the shafts remain as before, the rapidity of deterioration is in a large measure due to the action of the sea water at the point where the strains are concentrated. It is the case that a continuous liner on any propeller shaft must aid it to resist bending movement, but the action of the water to which I have referred is borne out by other experience.

When continuous liners are not made in one length or brazed at the joints, but are either stepped as shown on Fig. 4, or soldered as shown at Fig. 5, the action of the sea

Fig 4.

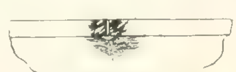


Fig 5.

water remains the same. There have been cases where tail shafts fitted with the so-called continuous liners with soldered joints, which on being sounded were found hollow at the joint, close inspection showed that the solder had parted. When the liner was cut there stood revealed defects similar to those shown on Figs. 4 and 5. I think this clearly illustrates the action of sea water on iron or steel shafts where the bending stresses are distinctly localized instead of being distributed, as they are with a really continuous liner or a parallel shaft. The same action takes place at the forward end of the propeller if the shaft at this part is not protected.

Propeller blades in some ships corrode very badly at the tips, and there have been instances where the action goes on until a certain amount of the blade is worn off and then it stops. Any explanation of this action must be more or less conjectural, but there is no doubt it is more mechanical than chemical. That being so, one may ask why some propellers run for years and show no sign of corrosion at the tips of the blades, while others are not running more than a few months until they are deeply pitted. If the action is due to mechanical causes, it arises from the form of the blade at the tip; and I suggest that an explanation lies in this, that the pitch at the affected portion of the blade is not in consonance with the part which propels the ship. In other words, if the parts where pitting goes on were made coarser in pitch, or the form slightly altered and the convexity at this part reduced, it would prove a remedy to an action which makes the propeller less efficient and later on calls for its renewal on account of its reduced surface.

Condensers, when made of cast iron, occasionally come under notice in connection with my subject, a fall in the vacuum being the first indication of the defect. The failures are not always due to mismanagement, and I give you two instances and leave you to determine to what extent design was responsible for the tear.

The first case is that of a steamer fitted with such a condenser. See Fig. 6. The part indicated formed the hotwell.

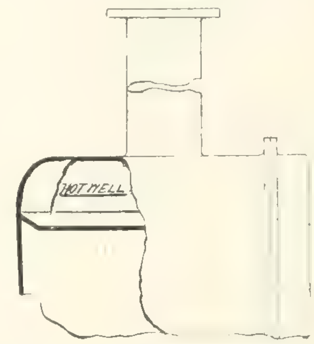


Fig. 6.

When warming up the engines in dock this condenser cracked across the top as indicated. You will readily see that in warming up preparatory to starting the engines, the sides and top—that is the bottom of the hotwell—must be raised to a higher temperature than the semi-circular part forming the crown of the hotwell. If we assume that the temperature in the condenser was 212 deg. F. and the semi-circular crown is 80 deg. F., there is a stress set up due to the difference of temperature quite sufficient to account for the fracture.

Another instance of a like nature, but which may have been accentuated by neglect, is that of a steamer in which the circulating water travelled through a passage cast underneath the condenser bottom, as shown on Fig. 7. This

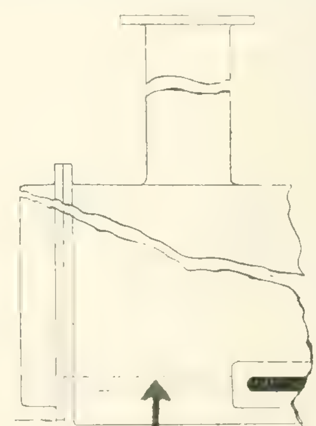


Fig. 7.

condenser, like the previous one, cracked and lost its vacuum. The fracture was across the bottom near to the circulating water passage, and so fine was the fracture that it was difficult to detect. As you are aware, initial strains, due to the cooling of the casting, are often set up in a condenser of this kind, and this may have some bearing on such a failure as that last mentioned.

Condenser tube plates sometimes fail, the crack running from one tube hole to another. Frequently this is caused by lamination of the plate. In some cases the ships had attained a good age before failure took place, but the discovery was always made when the tubes were being repacked after having been drawn and cleaned. In this case the material is at fault, yet the defect would probably have been seen had the plate been carefully examined after being bored and before being tapped.

Engine seats in some ships have failed, quite apart from stranding, and necessitated the removal of the engines from the vessel. In each case that has come under my notice the main fault lay in the riveting of the seat. The seats which have given most trouble are those of the form shown

on Fig. 8, and I think this arises from the difficulty of holding up the rivets in a seating such as this. They are hard to get at and in some corners holding up becomes a matter of faith. Other types of seating, however, have also required the removal of the engines for riveting and stiffening up.

As the engineer is responsible in the matter of design, and as such repairs cost much in delay and hard cash, seatings should receive every attention, not only in the drawing office, but in the yard.

In seatings of the design shown on Fig. 8, the bed plate should be supported at the middle by the fitting of a chock or stool at each girder, as shown on Fig. 9. This would add much to the stiffness of the engine under all conditions. Seatings of this form are not the best practice by any means, and failures have occurred through the vessel encountering heavy weather. In some cases the bed plates fractured close to the front column, as shown on Fig. 8; in others the bolts joining the bed plates and condenser gave out, while in still other cases the condenser cracked above the point where it joins the bedplate.

In an engine bedplate of this type the spread of the bolts is too great, and there is a heavy jump when racing which has a tendency to overstrain the material. By fitting the chocks suggested above the risk of failure is eliminated.

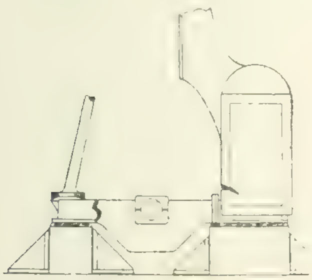


Fig 8

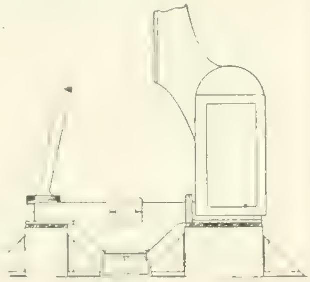


Fig 9

There is one point affecting bedplates deserving of notice here. In all cases they should be kept as close to the plating of the engine seat as possible. When the cast-iron chocks fitted between the engine and its seat exceed $2\frac{3}{4}$ in. to 3 in. in thickness, the holding-down bolts always show a greater tendency to slack back than when the chocks are kept from $1\frac{1}{2}$ in. to 2 in. in thickness. The thinner the chock the better, but of course when it gets too thin you have to discard cast and use wrought iron.

Copper steam pipes in steamers of the cargo class, which run much in light condition, frequently give way close to one or other of the flanges. The causes which conduce to this may in not a few instances be due to faulty design. Copper being an expensive material, it is the effort of the designer to put in as little as is consistent with efficiency. In some cases, if the pipes stand until the guarantee expires, this by some is considered good enough. In hundreds of cases the bends fitted in these pipes do not fulfil the object of their being, and even when they are of the easiest kind they have been known to fail. I am not enamoured even with the best of them, and maintain that far too much is expected of them. They are supposed to take up the expansion of the pipes between the condition of the boilers when cold and when under full steam. This they may do up to a certain point and time, but it is impossible for such a bend to take up the myriad minor strains which come on a pipe of this kind when the engine is at work, and particularly when racing in bad weather, without showing signs of fatigue.

This point may be made clear by taking a bend of a strong copper pipe, such as is very frequently fitted. It is rectangular, see Fig. 11, and marking it with a trammelew centre punch the points A and B. Having fixed it down, apply weights at the point A, and you will find that before it moves appreciably between those points you may have a load of three-eighths of a ton. From this it is evident that any stress of less amount will not move a bend, which remains rigid when at work. This being so, all lesser strains are transmitted through the bend and are borne by the copper close to the flange. Even although the bend does move under a given pressure it can only do so because of the resistance of the flange connection furthest from the point where the force is applied; and if this is to resist effectively then it should be stronger and more rigid than the bend. Now, this it is not. So that strains which will not move the bend are passed on to the copper close to the flange, and strains which will move the bend only do so because of the resistance made by the copper close to the flange, which is tantamount to saying that all strains arising from expansion or vibration in a bend of this nature are borne by the copper near the flange.

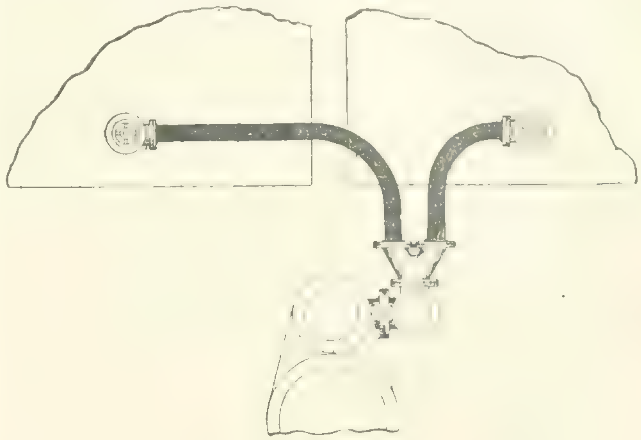


Fig 10

In many cases these bends should be discarded and a good expansion joint fitted in their stead. It may be said that the difficulty with steam pipe bends could be overcome by anchoring the ends of the pipe near the flange. In some cases it would be difficult to arrange, and in all cases it would be an admission that the arrangement was obviously unsatisfactory and had failed to attain its purpose.

On Fig. 10 a rough approximate plan of this arrangement of steam pipes as adopted in some cargo steamers is shown. This is what may be called the great M.E.M.E. plan. It represents the maximum of economy with the minimum of efficiency. It is adopted by some engineers who, having made their fortune, die and leave half a million more or less—to sorrow for the passing of a great economical genius. If it is compulsory that bent pipes should be fitted, then I would suggest that the face of the flange which receives the thrust or vibration should always be placed parallel with the face of te flange which transmits the movement from the engine, and that the line of pipe should be as nearly as possible at right angles to the flanges' faces. This would eliminate the transverse stresses which produce fatigue and ultimate failure.

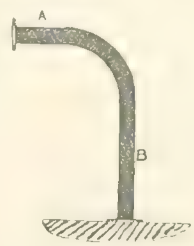


Fig. 11.

One often hears of the wearing action of a drop of water. In the course of years it can make an impression on the hardest substances. It is the drop of water from the expansion joint which is largely responsible for the adoption of the rectangular bend. When it falls on the back of your neck piping hot you are apt to say things—certainly you carry away impressions which, as I have said, are largely responsible for the use of this bend in steam pipes. Yet it should not be forgotten that if the expansion joint receives attention—and to be effective it must receive it—you will find therein a solution of all the troubles arising from the failure of steam pipes.

I am confident that quite 95 per cent. of the steam pipes

that have failed would never have done so had expansion joints been used instead of bends.

In many cases wrought-iron or steel pipes are fitted and appear to work well, even when bent, but the arguments against a copper rectangular bend apply to them with equal force.

In connection with this subject I would draw your attention to a neat model of Doust's patent expansion joint, which, if it does all that is claimed for it, should meet a much-felt want in regard to steam pipes. One point that has struck me regarding the arrangement is the possibility of its action being retarded or stopped by priming of the boilers. I may add that this invention has been fitted and worked satisfactorily on ranges of deck steam pipes.

When the circulating pump becomes defective, the incident brings home to the engineer the importance of keeping his pumping installation in first-class order, and of having not only every pipe, but every passage accessible at all times. As you know, sea water has a most injurious effect on cast iron which is immersed in it for some time. There are some kinds of this iron that become very soft after a few years' contact with sea water, so soft that you can cut it as if it were plumbago. Still all castings are not alike in this respect, and I am inclined to believe that the pump chambers most susceptible of deterioration are those in which air can be locked up through the irregularity of the passages. All cast-iron pumps are affected by it in the course of time, and if the arrangements are such that the passages cannot be thoroughly examined, there comes a time in the life of the pump when the metal gives way. It may take a long time, but if inspection is made easy by the pipes and chambers being accessible such accidents could, in most cases, be prevented.

An illustration is found in a case where the discharge from the circulating pump was jointed direct on to the condenser, and the water led by a passage along the bottom to the end, where it passed on its way through the tubes. After a number of years that passage gave way, and for a time those on board thought the ship was leaking. Ultimately the leak was located, but in quite an inaccessible position. Now had this burst been an extensive one it might well have caused the loss of the ship, as such a defect rendered the engines practically useless. The water which accumulated could only be dealt with effectively by the circulating pump, and as it drew the water through the bilge injection valve and pumped it through the break back into the ship the whole labour was lost.

Passages arranged in this way should be discarded in favour of a pipe led from the pump to the end of the condenser. Even with the best arrangements deterioration is rapid, and I am of the opinion that a test pressure should be put on all circulating pumps and passages at stated intervals in order to reveal any weak spot that may exist therein.

The air pump is not so troublesome, and when it does break down it can in most cases be traced to an act of neglect of ordinary care. There have, however, been accidents due to other causes. Such pumps are always fitted with a drain cock or relief valve to free the pump from water which may accumulate. The position of these outlets is one of some importance. Should the condenser become leaky and the position of the outlet be too high, it allows an abnormal quantity of water to gather; and if the engine is started quickly under such conditions the cover will be carried away and probably other damage done. The amount of water that can lodge in the air pump bottom should never be in excess of the quantity with which the pump has to deal under normal working conditions.

Sea valve chests of cast iron do not always receive the attention they should have when the vessel is in dry dock. They are affected by sea water and after some years are more liable to injury from stranding than when new. This injury may not always be apparent and a serious state of matters arises should such a defect open up when the vessel is straining in a heavy sea way. Such chests should be strong to begin with, and the gratings should be taken off regularly, and the chest cleaned and coated in the inside.

The stern bush, owing to the overhang of the propeller, has a heavy load placed on it, and more than any other bearing is liable to wear. In the case of vessels running in sandy waters the wear may be due to the sand. Yet great differences are found in the length of time such bushes will run without renewal of the lignum vitæ. Generally speaking, such bushes fitted with "end wood" for the wearing surface give better results than those fitted lengthways. One cause of wear sometimes overlooked is the broken propeller blade. It produces an unbalanced condition and the whole tendency is to impart an eccentric motion to the propeller. This condition wears out a bush more quickly than a propeller, which has its surface intact and is perfectly balanced while at work.

Piston rods (particularly high pressure) are liable to wear and groove, and if made of steel they appear to bend more easily than when made of wrought iron. The conditions which conduce to this arise from overheating. Such a rod will not bend at a normal working temperature, but if tight packing or priming exist these cause it to heat up and it yields. The steel rod has a higher tensile strength and greater ductility than wrought iron, and it is this last property—excellent for most purposes—which I think is objectionable in the steel rod, and has led to a more general use of wrought iron rods for this part of the engine.

Pistons themselves sometimes require renewal from external as well as inherent defects. In many cases where they are fitted with common springs the latter frequently break, and if unnoticed the pieces working up and down will wear a hole in the piston flange. Such a spring generally makes itself known by a quite audible sound when the engine is at work.

Low-pressure pistons should be carefully examined round the eyes and all core plugs should be tested. A number of such pistons, both iron and steel, have been condemned for defects at the part named.

Again, not a few pistons have failed from faulty design. Many years ago I had a case where the L.P. piston gave way. The eye remained on the rod while the body fell to the bottom of the cylinder. It was a compound engine and perhaps this accounted for the fact that no damage was done to the cylinder. The cause of failure was want of stiffness. There were ribs, but not sufficient either in number or in length, and the metal, gradually weakened by a slight movement, finally gave way. These ribs should come well out—at least two-thirds of the way from the eye to the flange—so as to bind the upper and lower plates of metal well together. When this is done there is little risk of failure, provided the piston is of the average depth.

I am finished. I was asked to write on a practical matter. It is an extensive subject, and the time at my disposal was limited, but I hope the paper will provoke discussion. Perfection can only be attained by experience, it need not necessarily be personal, and he is a wise man who, noting the mistakes of others, sets himself to avoid the errors into which they fell.

THROUGH pressure on our space we are obliged to hold over several articles, including Electricity on Board Ship and On Heat Losses.

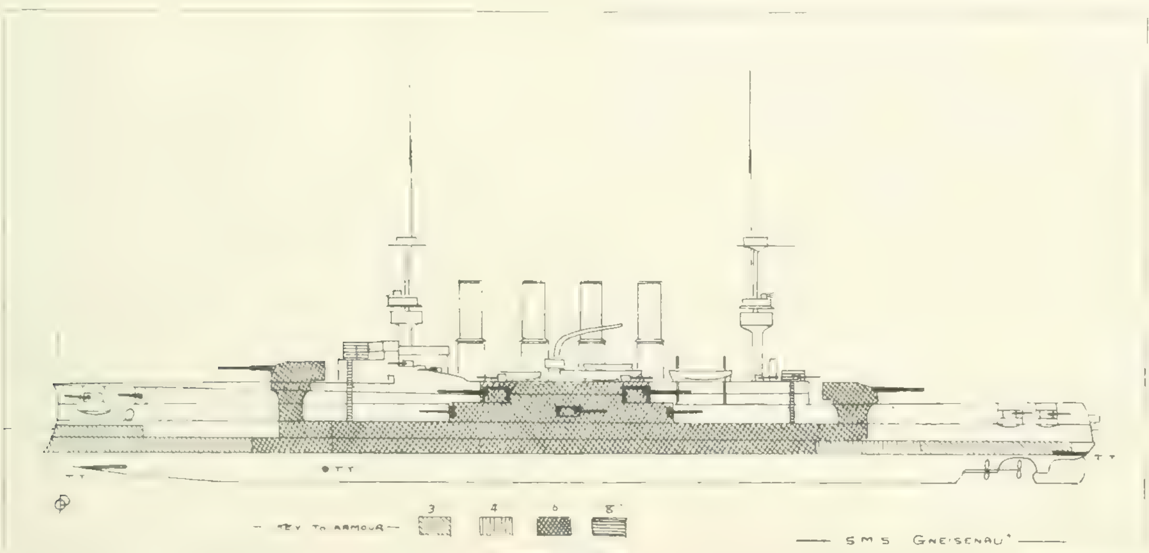
AEROPLANE CLUB DINNER.—Coincident with the first dinner of the Aeroplane Club, held in the Savoy Hotel on January 13th, the first Professor of Aeronautics was appointed for Gettingen University. An address on the future of "Aviation" was delivered after the dinner by Col. H. S. Massey, in which the progress of the aeroplane as a means of moving from place to place was discussed and the possibilities of the future indicated. Great expectations were formed as to what the early months of summer have in store for those who seek to navigate the air. A paper by a member followed, comparing the French and the American styles of air vessels.

MEMORIAL TO SIR GEORGE LIVESEY. With reference to the steps it has been decided to take to perpetuate the memory of the late Sir George Livesey, the Committee having the matter in hand desire to announce that contributions to the Fund should be sent to the Secretary of the Institution of Gas Engineers, 39, Victoria Street, Westminster. A sum of at least £10,000 is required for the object in view—the Endowment of a Livesey Professorship in Gas Engineering and Fuel, at the Leeds University—and contributions, both small and large will be welcomed. Having regard to the great services which Sir George Livesey rendered the industrial world, and indeed to all classes of the community, it is felt that there will be a general desire throughout the country to do honour to his memory.

THE GERMAN CRUISER "GNEISENAU."

THE completed *Gneisenau* and her sister the *Scharnhorst* represent Germany's reply to our *Warrior* class of armoured cruisers, and mark the abandonment of the "moderate dimension" theory—which produced the *Prince Heinrich* and *Roon* types—in favour of the big displacements which have become the vogue amongst the other Powers.

Of course, the *Gneisenau* is small compared to our *Inflexibles*, but it must be remembered that she has been some four years building, and was laid down long before "all-big-gun" ships were thought of, and even before the *Minotaur* had materialized; if she had been completed in two years, as our cruisers were, her advent would have created quite a healthy respect—as it is, we have some ten cruisers built that



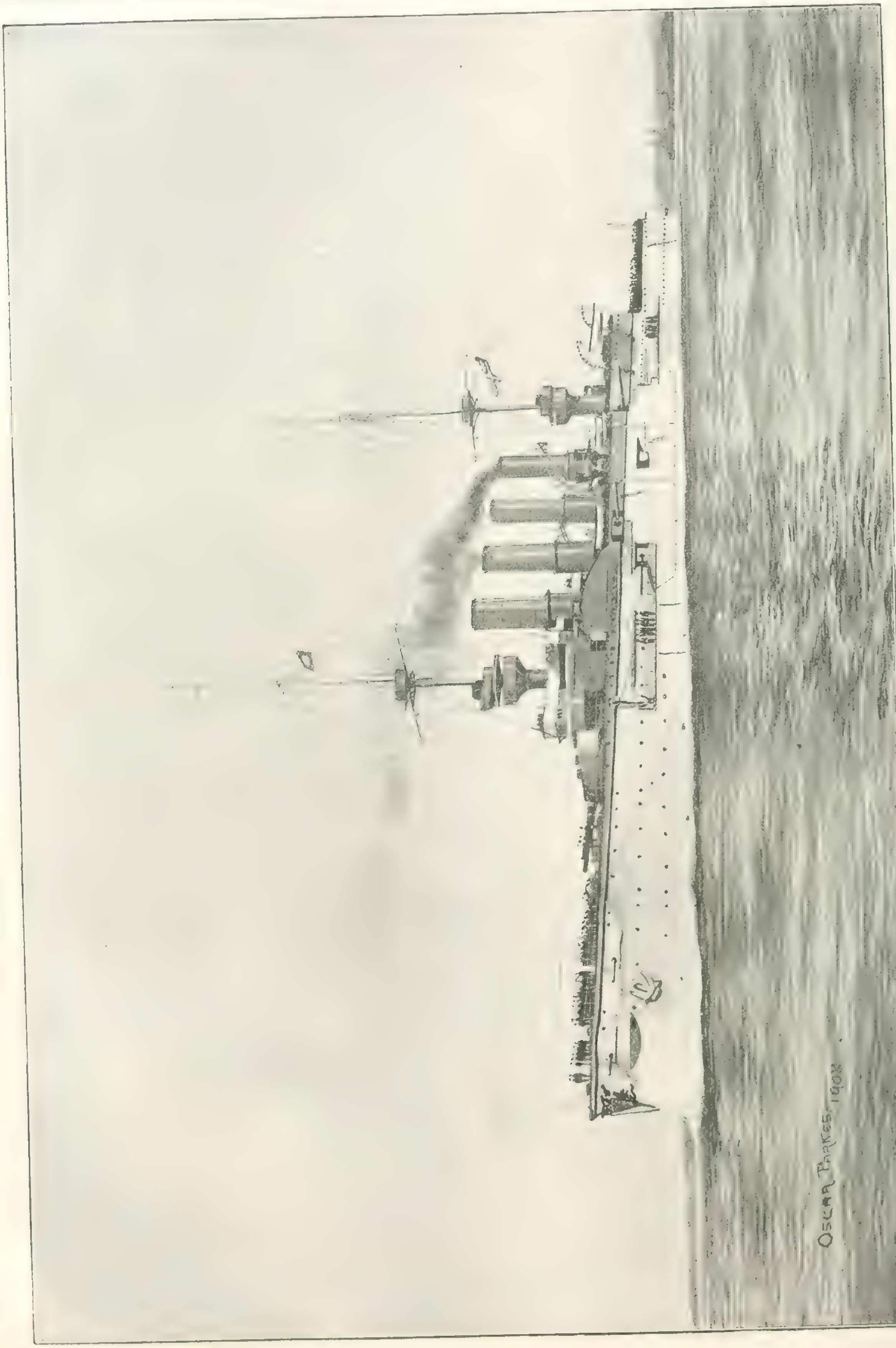
out-class her in every way, by reason of "Anno domini" more than any inadequacy of initial design in the German ship. She must, therefore, be regarded as a mean between the *Roons* and the big "E" and "F" types, and as such we propose to treat her.

The former class displace some 9,000 odd tons and carry an armament of four 8·2", ten 6" and twelve 24-pounder guns, with a designed speed of 21 knots, which was slightly exceeded on trial. They are very lightly protected, the main water-line belt and lower deck side armour being 3"-4" in thickness, while the gun-houses are 6"-4". The battery is not happily disposed, the 6" guns being grouped up together amidships in a redoubt in such a way that one or two well-placed hits would put the whole lot out of action—a fault also common to the battleships of the period—the *Wittelsbachs*. Now, in the *Scharnhorst* and *Gneisenau*, the general arrangement of guns is similar, but casemates take the place of the upper deck turrets—which eliminates the possibility of their becoming jammed, which is the great drawback in small turrets—and as their length has been increased from 403 to 429 feet, the guns are more widely spaced, and a bigger isolation zone for each is made possible. The axiom of earlier German constructors was "space without a gun is wasted" and consequently we find the *Kaiser* and *Wittelsbach* classes carrying huge secondary armaments, the guns being mounted at every conceivable corner of the super-structure round and about the bases of the big-gun turrets, and cramped up in thinly protected batteries amidships, the gun-ports being recesses of the most virulent "shell trap" variety, and the risk of blast and interference during action totally disregarded in the effort to attain the maximum end-on fire. Needless to say, later wisdom has demonstrated these initial faults, and the ships of these classes have been, or will soon be, taken in hand for partial reconstruction, entailing the removal of the most badly-placed guns and reduction of super-structure and top-hamper.

It is a pity that a greater speed could not have been given the *Gneisenau*, as 22·5 knots will never out-run any of our armoured cruisers—except perhaps the old *Cressy* class—nor over-haul the smaller "scouts"; added to which the *Scharnhorst* has severely strained herself by running aground and ripping half her bottom out, and is not expected to ever touch her trial figures again.

The *Blucher* (formerly "E") is a natural development of the *Gneisenau*, but exact details as regards her armaments are lacking. She is of about 15,000 tons displacement and was laid down at the time when our *Inflexibles* were commenced, the Wilhelmstrasse authorities being under the impression that our ships were going to be something about that weight, with an armament of 9·2" guns. The *Blucher* was therefore given either eight 11" guns, or a large number of 8·2" and 6"—particulars are conflicting. In any case it was soon seen that she would be out-classed, and "F" was designed with a 12·11" gun armament, and she will without doubt be superior to the *Inflexibles*.

It will, therefore, be seen that with the design of the *Gneisenau* Germany abandoned the shallow-draft warship and tentatively sought after something equal to England's then best. That she has not yet produced such a ship is due to the long-sightedness of Sir Philip Watts and our speed of construction, and



German Armoured Cruiser "Gneisenau."

so long as the two years' standard is maintained, it is doubtful if she ever will. We shall rely on fast battleships to checkmate "F" and not produce an armoured cruiser to excel her.

GERMAN CRUISERS "GNEISENAU" AND "SCHARNHORST."

Builders :

Scharnhorst,	Blohm & Voss,	Hamburg,	'04-'07
Gneisenau	Weser	Bremen,	'05-'08

Displacement : 11,000 tons. Dimensions 430 × 67 × 25 ft.

Armament : 8 8·2" Guns.
6 6" ..
20 24 pounder.
18 smaller.
4 Submerged torpedo tubes.

Protection :

Belt, amidships	6"
,, ends	3"
Armour deck	2"
Barbettes	6"
,, bases	$6\frac{3}{4}$"
Battery	6"
Conning tower	8"

Machinery : 3 Sets, 4 cyl., triple-expansion, 3-screw.
Schutz-Thornycroft boilers,
I.H.P. 26,000 = 22·5 knots.
Coal 2,000 tons max. and 200 tons liquid fuel.

Concentration of fire. Ahead / Astern 4 8·2", 2·6", 10 Q.F
Abeam 6 8·2", 3·6", 10 Q.F.

INTERNAL COMBUSTION ENGINES FOR SMALL BOATS.

A PAPER on Internal Combustion Engines for small boats was read by Mr. F. R. S. Bircham, on January 13th, to the Institution of Automobile Engineers, in the premises of the Institution of Mechanical Engineers, Westminster. There was a good attendance, and amongst those present we observed several members of the Institute of Marine Engineers, who doubtless were desirous of posting themselves up in the possibilities of this type of engine for marine propulsion. The chair was occupied by Dr. H. S. Hele-Shaw (vice-president). In the paper the author discussed five styles of boat, with the several adaptations of the machinery best suited for each. The open boat, useful for general purposes and necessitating compactness under adverse weather conditions, fitness to undergo rough usage, was the first to receive notice. Horizontal engines were advocated, bolted to cross thwarts, and of the two-cycle type, so designed and fitted as to admit of ready removal at the end of the season ; the flywheel may be arranged inside the crank case, should circumstances admit. The engine, being near midships to regulate the trim of the boat, can be controlled by gear on the fore end of the shaft within easy handling by the steersman. The larger open or partly decked boat has to face an enlarged sea area compared with the former type, and necessarily the importance of providing an installation of engine and gear which will stand sea spray and occasionally even more than spray, is manifest. Engines which will run at few revolutions, when required to face fairly heavy head seas, are specially useful, so that they require to be reliable at full, half and slow speed to be efficient. In such boats the engines are usually encased, but the parts should be designed and arranged as far as possible to avoid the risk of damage by sea water entering the boat. The forced system of lubrication can be applied satisfactorily and the filtration and cooling of the oil can be dealt with by means of surface-cooled pipes led outside the boat along the keel, thence to the filter case and oil pump suction. The steering gear is usually, in the larger boats, by means of a wheel with quadrant and chain or other adaptation to suit the circumstances. The reversing, starting or controlling levers can readily be fitted adjoining the steering wheel when under one man, but in the larger boats it may be necessary to have two men to work the gears. The more ambitious cabin boats require to be adapted to run for lengthened periods without skilled attention, and with stricter avoidance of oil or fuel which will give off noxious fumes. The engines are usually and preferably built in a space by themselves, enclosed as an engine-room, with the man in charge to control, acting under instructions from the bridge, conveyed by telegraph bell and indicator dial. The parts and details of the engines for this class of boat are required to be easily accessible for overhaul and adjustment, as while the machinery of the open boat or partly decked boat can be removed to the workshop for overhaul, the larger engines cannot be thus readily dealt with. Provision for disconnecting the crank shaft, piston and connecting rods should be made, so that removal can be effected without clearing away the whole engine ; thus doors in the case could be made suitable for getting out these details. Starting by compressed air is desirable in engines for this class of boat, and forced lubrication is advocated. The fuel tank can be placed on deck, elevated above the engines, so that gravity may act in carrying the oil down to the inlets. For fishing and commercial use the machinery requires, as in the former case, to be readily accessible for overhaul. The details should be strong, attention being paid more to economy in construction and in working expenses than to the embellishments of polished surfaces and finished workmanship. As the machinery may be entrusted to the charge of the boy, it is necessary to have everything as simple in detail as possible with good margin of strength. The control of the engines would also in this case be vested in the bridge, by means of telegraph and dial, but could be arranged to submit to bridge control direct by means of levers. Winches might require to be operated by power from the propelling machinery, and in this event an arrangement of clutch gear would be necessary. Careful attention is required to the balancing of the engines, to the size of flywheel and to the thrust bearing. Splash lubrication is recommended for this class of engine, and wick for the crossheads. In the larger types, however, the forced lubrication may be used with advantage. The fuel tank should be on deck as in the former case. For racing boats the chief requirements are lightness consistent with the necessary strength to keep up maximum power for comparatively lengthened periods, the machinery must be well protected so that any spray or water shipped under severe racing conditions shall not spoil the chances ; a pump or ejector is necessary to get rid of water from the boat. Forced lubrication is necessary here, and very careful provision so that every pin and joint shall obtain its due lubrication. Reversing by clutched gearing or by reversible propeller was discussed for the different types of boats, also the systems of ignition. A discussion took place at the close of the paper, when several points were criticised. A vote of thanks to the author was accorded.

We are advised by Messrs. Mosses & Mitchell that they have removed from 60 to 71, Chiswell Street, to 122 & 124, Golden Lane, E.C.

DINNER TO MR. JAMES MOLLISON.—At a complimentary dinner in Glasgow on the 23rd January, given to Mr. Mollison, who is retiring from the post of principal engineering surveyor to Lloyd's Register of Shipping for Glasgow district, after a service of thirty-five years, Mr. Thomas Bill, engineering director of Messrs. John Brown, of Clydebank, presided. Those present numbered 150, and represented the engineering, shipbuilding, steel making and allied industries of the West of Scotland. Among the guests were Mr. H. J. Cornish, chief surveyor of Lloyd's Register, and Mr. J. T. Milton, chief engineer-surveyor. In replying to the toast of his health, Mr. Mollison said he was one of the three original engineer-surveyors appointed by Lloyd's Register. He was glad as an engineer to have lived in a time of so many and so great engineering developments, and to have been in the service of a society which had done so much for the shipbuilding and shipping industry of the world.

THE FLEETS OF THE MAIL LINES.

(From our Own Correspondent.)

The Shipping Trade.

THE unprecedented depression in the shipping trade is having its effects in many directions. For one thing, the shipbreaker is busy, and his useful, if destructive industry, is likely to find itself extended before things are really and permanently better for the shipowner and his employés. By carelessness and want of knowledge too much tonnage has been produced, and this surplus will have to be got rid of before there can be any real and adequate improvement in the rates of freights. I say carelessness is one of the reasons for the over-production of tonnage, and I think I am right in using the expression. Capital has been too easily attainable by those who wished to build and acquire ships with other people's money. Bankers, for example, who would scarcely look at requests for loans on the security of freehold property in prosperous towns, would, for some extraordinary reason, finance shipping companies whose foundations were none too stable. Shipbuilders who felt that they must keep their yards together and their men employed, even if the orders obtainable spelt more loss than profit, would construct ships for men of straw practically on credit, whilst they, too, sought and obtained, assistance from their bankers. Then there were a numerous class of country investors who knew nothing of the shipping trade, but who lent their money with a free hand to speculative persons who proposed to build vessels with single ship companies, of which, of course, they were to be managers. No doubt in many of these cases the lenders and investors have suffered severe losses. But the tonnage, in payment for which their money has in part gone, remains and still hangs over the market. Until it is removed, or usefully employed, it is still a source of weakness and a cause of low freights. Things may be better in the future. But they can only be placed on a permanently sound foundation if those who have been so free with unnecessary capital in the past, are thoroughly frightened by their unhappy experiences and do not try to "get a little of their own back" by making fresh investments in shipping as soon as they begin to see things looking somewhat rosy again.

Meanwhile the march of improvement is rendering the new ship more and more economical and thus making the chance, that the older vessels will ever again find remunerative employment in the world's competition, more and more remote. A great deal of steam tonnage, therefore, must find its way to the scrap heap, and the sooner the owners of these obsolete vessels realize the fact and cut their losses the better it will be for themselves—since if they do not get much back they will at all events get rid of a constant source of outgoings—and for those who hold ships which can under ordinary conditions make a decent living in the trade.

There will, however, be compensations to the shipbuilder for the changed conditions under which he works. It is evident that the modern steel ship, though she is a better property commercially than her iron predecessor, is a much shorter-lived one. We have such iron vessels as the old *Aleppo* still doing good work when they are approaching the fiftieth year of their activity. But the steel ship seems to be worn out in less than half that time. It is better and cheaper to break her up before she has completed her first quarter of a century than to spend any more on structural renewals and on new machinery. Thus the shipbuilder will in the future have more frequent orders for the renewal of the shipowners' fleet than he has had in the past, though he will not have so many ships to lengthen and otherwise alter. Similarly the engineer may console himself for the prospective loss in the absence of contracts for re-engining and reboilering old ships in the reflection that existing ships with their machinery will need replacement earlier than heretofore.

The West India Royal Mail Steam Packet Company

has suffered a serious misfortune in the stranding of their passenger steamship *Trent*, which has gone ashore at Salmadino when on a voyage from New York and Colon to Southampton. How exactly the casualty occurred has not yet been made public. But the fact that it was serious is evidenced by the news that the Company's ss. *Magdalena*, after fruitlessly attempting to tow her off, gave up the attempt and took over her passengers in order to minimise for them the delay which must necessarily occur in the completion of their voyage. Subsequently the well-known salvage steamer *Premier* was got to work. But the job seems likely to be tedious, even if it be eventually crowned with success. A considerable quantity of cargo has already been jettisoned, and the ship, which hung aft, is reported to be holed in more places than one. The *Trent*, which is a single-screw steamer of upwards of 5500 tons gross register, was built by Messrs. Napier on the Clyde in 1900, and in the same year achieved a record, coming home from Barbadoes with the mails after an unprecedentedly short run.

Another unusual disaster was the loss of the Carron Company's ss. *Grange* some eighty-five miles north-east of the mouth of the Tyne, when on her voyage from Grangemouth to London with cargo and a considerable number of passengers. She undoubtedly encountered most violent weather, and in the result her fore hatch was burst in by the sea, the ship thereupon giving unmistakable signs of being on the point of foundering. Fortunately the steam trawler *Eleazar*, of Hartlepool, was in the neighbourhood and she took on board the large total of fifty-five persons, who were comprised in the crew and passengers of the injured vessel. Thus though a fine passenger vessel—built but some sixteen years ago on the Tyne by Messrs. Wigham, Richardson & Co.—is gone, there is no loss of life to be deplored. The foundering of the 1500-ton *Grange* so soon after the loss of the Great Eastern Railway Company's cargo steamer *Yarmouth* is remarkable enough, for one would have imagined that, heavy as is the weather often experienced in the cold North Sea, it would hardly be able to inflict fatal injuries on well-found vessels of modern construction and of no inconsiderable size.

The Cunard Company

is now giving the *Lusitania* a month's rest after the completion of her sixteenth round voyage across the Atlantic. During the something over a year and a quarter in which she has been at work she has consumed no less than 192,000 tons of coal, and has steamed over 100,000 miles with it, carrying on her various trips some 35,000 passengers. Her sister, the *Mauretania*, has now completed her repairs at Liverpool, and is ready to resume her place on the Atlantic before these notes will be in our readers' hands. It is stated that the Company are so satisfied with the manner in which the work upon her has been performed that they do not propose to send her for a trial trip. But it is evident that they expect her to do great things and to surpass even the high records which she had herself established prior to her present overhaul. She is now fitted on her after shafts with a pair of three-bladed propellers, weighing 22 tons, whilst the wing propellers are of new design, being solid in type with four blades each. Their weight is put at 18 tons each. The ship is now expected to make about 180 revolutions a minute.

Safety at Sea.

One or two recent circulars by the Board of Trade will have their effect in promoting safety at sea. In regard to grain cargoes the provision made for the securing of the shifting boards is to be disclosed—when making application to the Grain Committee—with greater detail than has formerly been the case, and it would seem that it is desired to encourage the fitting of reeled and close-spaced stanchions as the best means for ensuring the stability of the boards when fitted in grain ships. Similarly there has been a circular which settles certain details as to the mode of manufacturing life belts in order to insure that they will support the requisite weights and will not be liable to come to pieces when in use.

Bad Times

have left their mark on the Atlantic passenger traffic of 1908. We have to go back to the year 1904 to find a smaller passenger movement. In that year the figure returned was 1,503,177 persons. This year it has been 1,530,161, but 1908 compares badly enough with 1907, whose total was 2,437,328, and 1906, where the figure was not far short of two millions. Comparing 1908 with 1907 we see that there were in the second class some 62,000 fewer persons carried

to the westward. To the eastward—thanks to the depression in the United States, and to the feeling amongst those of European birth that they would be wise to return to the countries of their origin—there was only a decrease of 2200 persons. The same causes acted with greater force in regard to the steerage traffic. To the eastward there was an actual increase of, say, 108,000. But to the westward there was a heavy decrease, amounting to, say, 962,000 persons, the figures of actual passengers borne being 1,364,685 in 1907 against only 402,000 in 1908. As to the saloon business there was recorded a decrease of 13,200 to the westward and 7300 to the eastward in comparison with the numbers for the year 1907. These figures are significant in themselves. But when one remembers the large amount of new tonnage which the years 1907 and 1908 saw added to the fleets of the mail lines, and remembers the costliness of the construction and maintenance of these big and fast ships; when one thinks too of how the more modern craft are apt to attract what traffic is offering to themselves and to take it away from the older vessels, one begins to realize what a bad time some shipping companies must have had and to await the publication of their accounts with a feeling somewhat approaching dismay.

The Union-Castle Company

has, as usual, had the courage which is the foundation of all success in business. Knowing, as every one who knows anything knows, that the service with which it provides South Africa is a magnificent and cheap one, both for the Home and Colonial Governments, it is fully aware that no responsible persons can intend to attempt to wrest its mail contract from it at the present time. New contractors would be paying a heavy price for the certainty of a conflict with a wealthy and well-established rival, with only at best the remote possibility of coming out winner in the competition. The cost of such a fleet as would enable them to begin the struggle with Messrs. Donald Currie & Co. would in itself be a heavy matter. This being undesirable, the managers of the Union Castle Line are taking advantage of the unprecedentedly low prices for new tonnage, and have placed orders for no less than three important steamers within the last month. One of these ships will be constructed by Messrs. Barclay, Curle & Co., of Glasgow—a firm which has already provided many fine ships for the intermediate side of the fleet. But the more important part of the announcement refers to the remaining vessels. They are to be twin-screw mail steamers of 13,000 tons apiece. The order for these ships has been divided, one vessel being given Messrs. Harland & Wolff, of Belfast, who have built so many good vessels for the old Union Line, culminating in the *Saxon*, which was delivered after the amalgamation of the two lines. Since that time they have been responsible for one of the pair of mail steamers which consisted of the *Armadale Castle* and the *Kenilworth Castle*. The Fairfield Shipbuilding Company, which shared with the Belfast firm the work of constructing these two vessels in 1904-5, has now taken the contract for the other of the two new vessels.

The result of these additions to the fleet will be that the sole remaining single-screw ship in the regular service of the mail line will go into reserve, as will one of the older twin-screw ships. The *Dunottar Castle* and *Dunvegan Castle*, the two ships at present in reserve, will probably find other employment. Indeed, the former has already found other scope for her activities, having not so long ago come back to Southampton Water after a twelve months' charter to the Panama Railway Company, whilst she is now announced as being under engagement to a firm of yachting agents, whose business was recently interrupted by the sinking off Dungeness of the old steam yacht *Argonaut*. Those who book passages by the *Dunottar Castle* will be apt to think that the casualty which sank the old ship and indirectly was the means of affording them the chance of cruising in the *Dunottar Castle* was by no means an unmixed evil.

The "Nicaraguan."

After many days there has been held an inquiry into the circumstances attending the loss of the Leyland line steamship *Nicaraguan*, a vessel which was built for and originally owned by the old West India and Pacific Company and absorbed some nine years ago by the present owners. The *Nicaraguan* left Norfolk, Virginia, on the 8th June, 1907, with a cargo of phosphate rock which she had loaded at Tapa in Florida. She had on board a crew of forty-three men and one distressed seaman as a passenger. Dublin was her port of destination, but she was never heard of after sailing. There seems to have been some question as to the loading of the vessel at Tampa, and also as to the amount of coal which she took aboard at Norfolk. It was stated at the inquiry that she had stuck in the mud on the bar when leaving Tampa. But no report as to this incident had been received from the master, and so there was no evidence as to the damage, if any, which she had then sustained. The Court held that, though she was seaworthy when she left Tampa, there was no evidence to show that she was seaworthy when she sailed from Norfolk. It did appear that she was deeper when she left the latter port than the amount of deadweight shown to have been in her would make her, and from the evidence there was a doubt as to the reason why she was so deep. It might have been that she was strained on the bar and that water had consequently found its way into her tanks, or it might have been that the tanks had been purposely filled to increase her stability. The suggested cause of her loss was the probable shifting of her coal which would render her liable to broach to in the heavy sea which she undoubtedly encountered.

The London County Council

has now advertised for tenders from proposing purchasers of its unhappy steamboats. Tenders are to be sent in before the 9th February. We notice in the advertisement one most remarkable clause. Preference, we are told, will be given to such tenderers who undertake to provide "an efficient service" on the Thames. Supposing such tenderers come forward it will be hard indeed for the Council to insure that the purchasers maintain it, and it will be harder still to define what kind of a service will be "efficient." Considering that the Council—with the resources of the ratepayers at their back, and with the reckless disregard for other people's money which is the only marked characteristic of public bodies in England—was unable to continue its service, we may take it as probable that no genuine tender will be forthcoming on this basis, and that the true reason for the insertion of the condition was a desire to conciliate those persons who regret the shutting down of the boats. The British public is easily caught by chaff of this simple nature.

The Origin of Improvements at Sea.

We have been interested during the last few weeks to learn the origin of two now common objects at sea. The first is the engine-room telegraph, which, it is said, was first used on one of Mr. David McBrayne's steamers in the sixties. We are rather at a loss, however, to imagine how the call boy—who, we think, was the predecessor in office of the telegraph—managed to do his duty in this regard aboard such vessels as the *Persia* and the *Great Eastern*, where distances were considerable. The point is perhaps sufficiently interesting to make it worth while for us to ask if some correspondent, who remembers the practice of those days, will give some information on the subject.

The other point comes from no less an authority than the "Sporting Times." That interesting journal reminds us that it is not so long ago that passengers slept in the general cabin at sea as they now have to do in certain lines of channel steamers. The story goes that prior to the American Civil War a person called Shreve ran a line of steamers on the Mississippi and, instead of letting his customers sleep in open berths according to the general practice, he partitioned rooms off with wooden bulkheads and called each division after the name of one of the States of the Union—Illinois, Kentucky and so on—so the rooms on his vessel got to be called state-rooms. It may be true as regards the practice on American river steamers, but we hardly think the story applies to the Atlantic, for there were state-rooms there from the earliest times of steamers. Dickens, for instance, in his American Notes, gives a rather sarcastic account of the state-room allotted to him on board the *Britannia*, pioneer ship of the Cunard Company, and I fancy that even in the old Indiamen there were some state-rooms, though, on the other hand, it must be admitted that within the last few years, if not even now, officers' wives on Government troopships are berthed in a general cabin.

SANITARY FITTINGS.

AMONG the many steam yachts that have been fitted with the latest improved appliances appertaining to sanitary engineering, special mention must be made of the *Iolanda*, of which an illustration is given. This boat was built for Morton K. Plant, Esq., Commodore of the New York Yacht Club, U.S.A., at Leith by Messrs. Ramage and Ferguson, Ltd., to the design of Messrs. Cox and King, 5 and 6, Suffolk Street, Pall Mall, London, and provides every luxury that up-to-date contrivance can afford for the comfort of those on board. Particulars of the boat were given in our issue of April last.

S.Y. "Iolanda."

The sanitary fittings for the state cabins and officers' quarters include Jennings' "Pioneer" (below water-line) water-closets with compressed air discharge, by which means the contents of basin are discharged by the simple raising and lowering of a handle, as in the case of ordinary house water-closets. The air pressure is maintained by the latest approved stop-and-start device. Porcelain enamelled cast-iron baths (of an improved pattern suitable for yachts), fitted with Jennings' patent "Duplex" combination hot, cold and tepid supply valves, by which the water can be obtained at the required temperature, the combined supplies being controlled by one handle. Some of the baths are fitted with showers to which hot, cold and tepid water is also supplied.

The wastes are of a simple form and actuated by a throw-over lever, which obviates the objectionable chain-and-plug or pull-up waste.

The lavatory basins are of handsome design, and have marble tops with silver-plated supports. These are also fitted with the "Duplex" combined supply valves and throw-over wastes.

Similar fittings have been installed recently by Messrs. George Jennings, Ltd., of Lambeth Palace Road, London, on the following steam yachts:—*Valhalla*, *Maund*, *Agawa*, *Amalthæa*, and *Kawala*, with most satisfactory results.

ELECTROCUTION IN A BOILER.—A curious case of electrocution, attended unhappily with a fatal result, has taken place in a boiler which was being cleaned by the victim, a labourer aged forty-five. According to the evidence the temperature in the boiler was about 90 deg.; a special paint had been applied to the plating and a hand electric lamp with a current of 220 volts was in use. The labourer is supposed to have become faint, due to the heat and the fumes of the paint, and fell, dragging the lamp, from which presumably the wires became detached, and the current passed through his body, receptive by reason of the heat and moisture.

OBITUARY.

DR. FRANCIS ELGAR.—It is with sincere regret that we record the death of Dr. Francis Elgar, the eminent naval architect, who passed away suddenly at Monte Carlo, on January 17th. He belonged to a family which had long been connected with the Royal Dockyard at Portsmouth. Born in 1845, he began his training at Portsmouth Dockyard and was so successful in his work, as to be selected by the Admiralty in 1864, as one of the eight shipbuilding students whom they appointed to the Royal School of Naval Architecture and Marine Engineering, when it was opened.

After three years' course of study he passed from the school with great distinction and was appointed by the then Director of Naval Construction, Sir Edward Reed, as an Inspector of the turret-ship Captain, then building at Birkenhead.

Subsequently he was placed on the constructive staff of Portsmouth Dockyard. In 1871, he left the Admiralty service in order to take up the position of general professional assistant to Sir Edward Reed, who had retired from the office of Director of Naval Construction and had established a large private practice, designing warships for Germany, Japan, Brazil and Chili, in addition to vessels for the Mercantile Marine.

After occupying the position for eight years, Mr. Elgar severed his connection with Sir Edward Reed, and undertook the post of Adviser upon Naval Construction to the Japanese Government, which he held until 1881.

On his return to this country he practised as a consulting naval architect for a period of from five to six years.

In 1883, the widow of the eminent marine engineer, John Elder, founded at the University of Glasgow the first British Professorship of Naval Architecture, and the position was offered to and accepted by Mr. Elgar. The appointment was universally applauded, as the new Professor had, in addition to his scientific and practical training, a large and varied experience of actual work.

The late Dr. Francis Elgar, LL.D., F.R.S.

He had held this position less than three years when the Admiralty appointed him to the responsible post of Director of Dockyards, and entrusted him with the onerous duty of carrying through a complete reorganization of these great

national establishments. This work occupied him for the years 1886—1892, and the success achieved was recognised, not only by his professional brethren, but also in Parliament.

In 1892, Dr. Elgar was invited to join the directorate of the Fairfield Shipbuilding and Engineering Company, Glasgow, and act as their consulting naval architect, in order to fill the gap in the organization which the death of Sir William Pearce had made, and his connection with the Company continued up to 1906, when he retired in order to enjoy some well-earned leisure. However, circumstances arose in connection with the firm of Messrs. Cammell, Laird & Company, with which the Fairfield Company had close relations, and Dr. Elgar was induced to take the chairmanship of both Companies in order to carry through a complete organization of Messrs. Cammell, Laird & Company's business. With that sense of public spirit and private sympathy so marked in him, he undertook the arduous task and it is not unreasonable to assume that the work involved in this task became such a tax on his strength as to be an important factor in the fatal termination of his illness, which originated from a slight accident and was regarded as not dangerous by his doctors until towards the end.

Dr. Elgar had conferred upon him the honorary degree of LL.D. by the Glasgow University, he was a Fellow of the Royal Societies of London and Edinburgh and honorary Vice-President and Treasurer of the Institution of Naval Architects, a Member of the Council of the Institution of Civil Engineers and the Institute of Metals. He was author of the book on "The Ships of the Navy," published in 1873, and served as President of the "Sette of Odd Volumes" about fifteen years ago, and was a member of the Tariff Commission of 1904.

His professional and private friends will ever remember him with feelings of endearment, for his generous character and his ever readiness to help those who had the privilege of his acquaintance.

Dr. Elgar married, in 1889, Ethel, the daughter of Mr. John Howard Coles, of London, who survives him.

In a paper read at the Institute of Marine Engineers some nine years ago, occurs the passage "I have often thought it is a providential circumstance that the 410 millions in China have been held in check, by whatever cause, whether by superstition or tradition, as the inroad of a few millions upon the adjoining territory would create considerable trouble if they were energetic and hungry, even with the ancestral tablets before their eyes"; and in *Chambers' Journal* for January an article appears entitled "Western want and wanton waste," dealing with the question of the yellow peril and pointing out that the thrift of the Japanese and Chinese, with their habitual utilization of everything so that nothing should be lost, is the element which will tell, and prevail in the ultimate struggle for race supremacy between the Eastern and Western powers. This aspect of the question we do not propose to discuss, it is somewhat outside of our scope besides being controversial and of many sides. The explanation given by a well-known mustard manufacturer that he made a fortune off what people left on their plates conveys a reproach to the general public; it is a reproach applicable in many directions, and it is a reproach that every one ought to do his best to remove. We are at one with the writer of the paper as to turning our systematic attention to prevent waste of material and in our last issue this subject was incidentally remarked upon in our opening article. The writer in the journal referred to deals with the waste of food on shore; it is also applicable to the sea in respect to food, yet not to the same extent as in former years—if our observations on passenger steamers are correct. Improvements and economies have been effected in all departments of the work of a steamship; coal per ton of cargo carried per mile has been reduced; oil for lubrication has been brought down, stores for general use have been minimised, still, however, there is scope for the inventive genius of the thrifty economiser in engine-room and stokehold. It is no less a duty than a privilege to have and exercise the faculty of preventing waste and utilizing materials to the best advantage, and there are many appliances brought out from time to time with these objects in view.

ACCIDENT TO S.S. "PATRIS."

It is satisfactory to note that in spite of the large number of vessels launched from the shipbuilding yards of this country every year it is seldom one has to record an accident in this connection, and it speaks volumes for those on whose shoulders rests the responsibility of making every provision to ensure a successful result.

That the possible is not always provided against was exemplified recently by the serious accident which occurred at the launch of the Greek steamship *Patris* from the shipbuilding yard of the Northumberland Shipbuilding Company, Howden-on-Tyne.

We have much pleasure in presenting to our readers a representation of a full-page plate showing the vessel entering the water.

It would appear that when the vessel had almost got clear of the ways some of the drags did not come into effective operation in order to properly check the vessel when she entered the water.

The result of this want of checking power was that the vessel crossed the river at a high rate of speed, and ultimately her stern came into violent contact with the dock gates of the Mercantile Dry Dock Company, Jarrow, opposite to the Northumberland yard. The dock at the time was full of water and contained the steamship *Ilderton*, of London, which was just ready to leave.

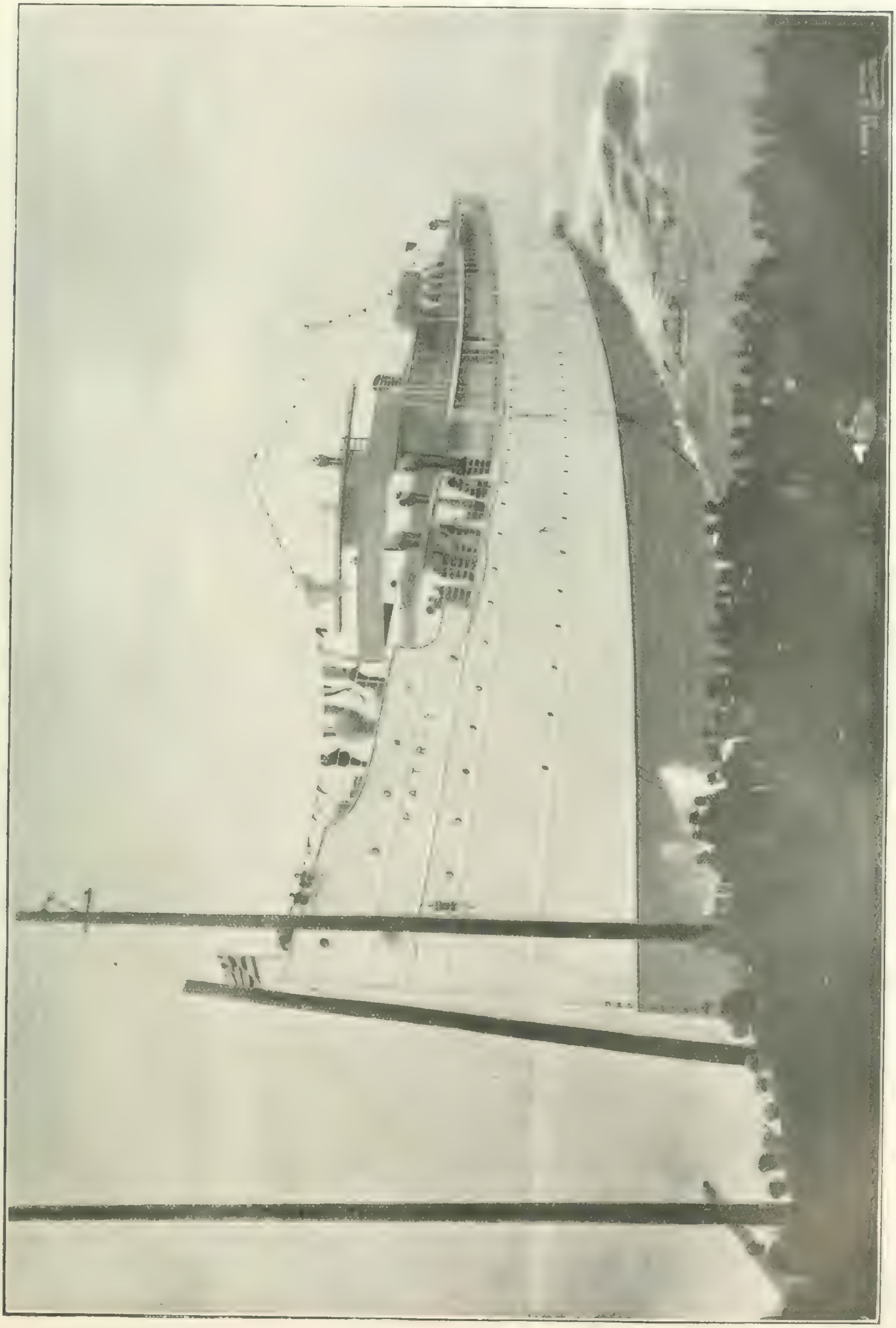
The steamship *Patris* first struck the dock gates, smashing one gate and throwing the other against the quay wall, and then crashed into the stern of the steamship *Ilderton*.

After the collision the steamship *Patris* was found to be resting on the sill at the dock entrance, and seven tugs were requisitioned to manœuvre her out of her dangerous position, which operation took nearly an hour before she was got out into the river.

The poop of the steamship *Ilderton* was considerably damaged, and she was subsequently removed into an adjoining dock for repair.

At the Institute of Marine Engineers on Friday, the 15th January, a Bohemian concert was held on the invitation of Mr. and Mrs. Jas. Adamson and Mr. W. E. Farenden. Mr. J. G. Hawthorn presided over a large gathering of juniors and friends. The first part of the programme opened with a pianoforte solo, "Poppies," very ably executed by Miss C. Silver, who acted as accompanist during the evening; and the contributions which followed, "The Bedouin Love Song," by Mr. W. E. Farenden, "The Slave Song," by Miss Weir, and "Obadiah," humorous song by Mr. D. T. Phillips, were well received. Further songs from Miss Maggie Lang, "Scenes that are brightest," and Mr. Albert Frisby, "The Lowland Sea," were also greatly appreciated, as was the pianoforte solo, "Mendelssohn's Capriccisso," by Miss Dorothy McKenzie. After the interval, during which refreshments were handed round, Miss McKenzie gave another finely executed overture, "Zampa," and the humorous element contributed by Mr. T. McFarlane, who sang several of Lauder's Scotch songs, afforded evident enjoyment. Miss Lang afterwards favoured again with the song "Down the vale," and Mr. Farenden with "To-morrow will be Friday." Another feature of the second part of the programme was Miss Robertson's expressive recital of the humorous piece "Love in a balloon," which was followed by a duet, "Friendship," sung very effectively by Misses Silver and Weir. The programme was brought to a close with Mr. Frisby's spirited rendering of "Chorus, gentlemen."

Hearty votes of thanks were accorded to Mr. and Mrs. Adamson and Mr. Farenden for the enjoyable fare they had provided, also to the chairman for presiding.



S.S. "Patris."

THE M.D.S. INTERNAL COMBUSTION ENGINE.

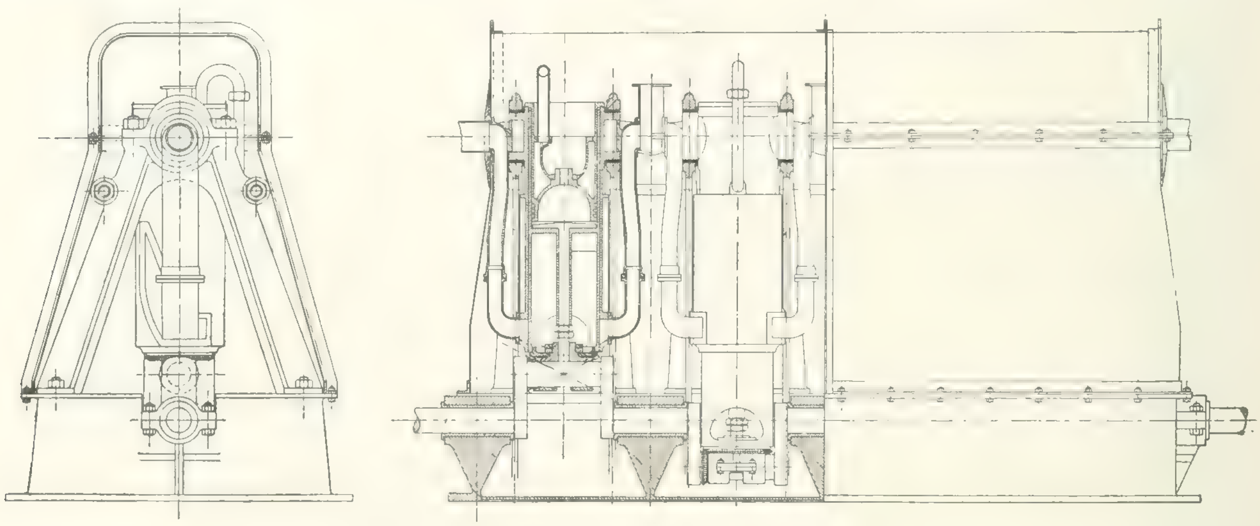
THE engine illustrated in the adjoining diagram constitutes a radical departure in design from that of existing types, as it has no moving valves, rods, cams, tappets and springs, no connecting rod, no pockets opening into the combustion chamber, no side thrust on the cylinder walls, and has only three moving parts, *viz.*, a cylinder or guide with a head attached thereto, a piston and a crank-shaft and fly-wheel.

The cylinder is made to oscillate on trunnions, and has within it a piston which is directly coupled to the crank-shaft. The upper end of the piston is provided with a tubular extension which works on the head and which forms the explosion chamber.

guide, the upper end of the piston port having also become uncovered by the disc.

As the piston returns the products of the explosion are expelled, the piston completing the entire revolution.

It will be seen that the combustion chamber is contained within the guide head, the upper face of the piston and the tubular extension, the form of the combustion chamber at the moment of maximum compression approaching as nearly as possible to that of a hollow sphere, the peripheral surface therefore being reduced to a minimum. It is claimed that this combustion chamber has a marked superiority over that of any existing engines on the Otto cycle. Further, the whole of the surfaces, being readily accessible, can be machined and polished, with the result that the transfer of heat is minimised and the deposit of carbon avoided.



The diagrams illustrate in end and side elevation a 40-H.P. 4-cylinder engine, of which two sets are on order for a twin-screw 50-feet launch

The head is fitted with rings in the same way as an ordinary piston. Rotary motion is imparted to the piston by means of a bevel-wheel fixed on the lower end of the piston and engaging with another bevel-wheel fixed on the crank-pin, the ratio being two revolutions of the crank-shaft to one revolution of the piston. In the piston is a port or tube.

The engine works on the ordinary Otto cycle. On the suction-stroke the port in the piston coincides with a port in the guide through which the mixture is drawn into the explosion chamber, and during which period the piston is rotating a quarter of a revolution. The port in the piston is now closed by being revolved under a disc which is fitted on the diaphragm of the piston by a rod extending through the piston, the squared end of which fits into a recess in the crank-pin brasses. The mixture is then compressed by the return stroke of the piston, which has then rotated a further quarter of a revolution. The charge is then fired by means of an ordinary sparking plug fixed in the head.

The piston has on the end of this stroke made another quarter revolution, and has brought the port in the piston in coincidence with another port in the

The sparking plug is fixed centrally in the dome of the cylinder head. The direction of flow of the incoming charge through the piston port is vertically upwards in such a manner that the gases impinge directly on the sparking plug. By this means misfire becomes a practical impossibility so far as the engine design is concerned.

The design of the engine permits openings for the flow and discharge of the gases of the largest possible sectional area to be introduced; as a result a full charge is always obtainable and the scavenging effect is perfected. An extremely advantageous result is derived from the fact that the piston port is common to both inlet and exhaust. By this means a proportion of the heat given up by the exhaust gases on flowing through the port is transferred to the incoming charge.

The thrust of the piston being always direct on the crank-pin, any side thrust on the cylinder guide disappears, while the rotation of the piston at the same time improves the condition of lubrication and reduces the frictional losses during its travel.

As the trunk piston floats on the oil film between its surface and that of the guide, the work done in rotating it becomes practically negligible, while the

duty of the bevel gear being simply to rotate the piston, the wear of the teeth is also a negligible quantity.

Lubrication is effected by the simplest means, the majority of the wearing surfaces receiving the oil supply by means of an oil-way through the trunnions. The crank brasses and bevels are lubricated by splash. The opening up of the engine after running reveals the fact that all wearing surfaces are lubricated in a most efficient manner.

The cylinder guide is water-jacketed from the bottom to the upper level of the rings above the combustion chamber, and the head is also water-jacketed around these rings, so that the rings are cooled by a continuous circulation on both sides. This method of cooling the rings is a most important feature, as it has the advantage of ensuring their complete efficiency.

This new engine is being dealt with by the Mechanical Development Syndicate, 36, Victoria Street, S.W., who have a running engine on view.

THE ELECTRICAL TRANSMISSION OF POWER FOR MAIN MARINE PROPULSION AND SPEED REGULATION.

THE adjourned discussion on Mr. W. P. Durtnall's paper on "The electrical transmission of power for main marine propulsion," was held at the Institute of Marine Engineers, Stratford, on Monday, January 11th. Mr. J. McLaren (member of Council) presided.

In opening the discussion, Mr. Durtnall said the object of the system he advocated was to obtain the highest efficiency in running the turbine at its highest speed in turbine-driven ships, and at the same time obtaining the maximum propeller speed. The principle could also be applied with success to non-reversible gas engines and oil engines. Gears were fairly suitable for small powers but for large powers the "all electric" method was most suitable, polyphase induction motors being placed at the stern of the vessel. In his opinion the use of polyphase alternating current by squirrel—cage rotor was the only way of dealing with large powers. In reply to a question raised at the last discussion as to how variation in speed was to be obtained with a machine of this description, Mr. Durtnall described a method of slipping the field of the generator and varying the periodicity of the whole system. He also demonstrated the loss in propulsive efficiency in the steam-driven vessel during heavy weather due to the unequal immersion of the propellers and consequent extra resistance to propeller rotation, and a method of synchronizing in the electrical system by which power could be saved and propulsion improved. Mr. H. H. B. Deane considered Mr. Durtnall's proposals to be practicable and good theoretically from the electrical standpoint, and was of the opinion that he had evolved a very good speed regulator with the polyphase system. He quoted Dr. Elgar's statement that the problem was to secure a combination of the turbine and propeller such as to give an efficient speed of the turbine without unduly reducing the diameter of the propeller, and thought that another necessary point to be observed was to keep the speed of the propeller at its economical limit, as the propulsive efficiency fell when the propeller speed rose above a certain limit. This result Mr. Durtnall claimed to have achieved. He was convinced that the polyphase system was the most suitable, the outstanding advantage being that it could be subjected to very much more severe stresses and strains than the continuous current machines as there was not the trouble of commutation to be considered. With a short-circuited rotor, also, it was possible to keep the potential down to a very low figure. Mr. T. R. Stuart referred to the risk of damage through leaky water pipes, and also to the use of slip rings in reversing, mentioned by Mr. Durtnall, which he thought would have a bad effect in introducing rubbing surfaces. Mr. F. M. Timpson spoke of the turbine not being applicable to low-speed vessels at present, and thought the difficulty might be overcome by means of gearing such as Mr. Durtnall advocated. Mr. W. E. Farenden asked how the saving in fuel consumption, claimed by Mr. Durtnall, could be obtained by the proposed system. Mr. J. Howie questioned whether overloading with the polyphase system in a big marine installation might not have very serious effects. With regard to the question of water damaging the installation Mr. Deane gave several instances where installations had been under water without any harmful effects resulting. Mr. J. S. Gander asked what effect the current would have upon the ship's compass, he presumed direct current only would have any adverse effect. He also asked how the system would be affected by the Board of Trade regulations with regard to voltage. He thought that in ships with the single wiring system armouring should be avoided altogether. Mr. J. H. Redman asked whether Mr. Durtnall intended to feed into a bus bar from one or more generators and then distribute the current to twin and triple screws or to fit each propeller with its own generator in order that reversing and speed regulation of the screws might be accomplished independently, as he understood Mr. Durtnall to say that the polarity of the exciter must be reversed in order to reverse the propeller. Mr. A. Robertson questioned whether it was intended in the new system to have two separate classes of men in control, or whether the marine engineer of the future would require to combine, along with an expert marine engineering education, an expert electrical education. The Chairman remarked with regard to rubbing surfaces that the practical trouble in that connection was with brush gear and commutators which would not be used in the proposed system. On considering Mr. Durtnall's proposals carefully, the scheme commended itself to him as being a very good one, and if it were brought to a practical issue the Board of Trade regulations as to limit of voltage would not stand in the way of progress, but would be revised to suit the new conditions. He considered alternating preferable to continuous current for marine work. Mr. Durtnall remarked that he intended on the evening set apart for his reply, March 15th, to treat in the fullest detail on all the points that had been raised in the various discussions on the subject. He invited criticism and asked members to send in to the Hon. Secretary any questions on matters which appeared doubtful to them.

In proposing a vote of thanks to Mr. Durtnall and also to Mr. Deane for his remarks, the Hon. Secretary asked if Mr. Durtnall would, in his reply, refer to the system of electrical propulsion described by Mr. Mavor before the Institute of Engineers and Shipbuilders in Scotland. The proposal was seconded by Mr. Farenden and carried with acclamation. A vote of thanks was also accorded to the chairman on the proposal of Mr. Gander.

THE FIRE ON THE "PAPAROA."—Towards the close of the voyage recently completed, the *Paparoa* (New Zealand Shipping Co.) caught fire in the hold containing refrigerated cargo, and by a coincidence the coal in the bunker—not immediately contiguous to the hold, also heated up. The bunker fire was soon controlled, but that in the cargo space was not so easily got under, except by flooding the hold. The second engineer, Mr. Wilson, and the chief refrigerating engineer, Mr. White, in order to trace the extent of the fire and its location relatively to the refrigerated compartments, ventured along the trunk ways. It was then found that the engineers had remained in the trunk way to seal up a door, with the object of confining the damaging fumes, and the chief engineer, Mr. Brown, becoming anxious about them, on following up, found they had both been overcome by the fumes. Assistance was at once forthcoming, as several of the stewards, hearing the calls for help, sprang from their berths and made their way to the trunk entrance. The engineers were brought out from what nearly proved a chamber of death to them, restoratives were applied and consciousness was restored. Unfortunately the second engineer is still suffering so severely that he will be unable to resume duty in time to rejoin the ship.

NAVAL MATTERS—PAST AND PROSPECTIVE.

(From our Own Correspondents.)

Portsmouth Dockyard.

THE new battleship *Neptune* was officially commenced on January 19th, at which time a large quantity of material had arrived here. Beyond the fact that in the current Estimates £138,891 has been allowed for the vessel and that she is to be similar to the *St. Vincent*, nothing much is known. The contract for the turbines has been placed with Messrs. John Brown, Limited, Clydebank, and Messrs. Harland & Wolff, Belfast, are to supply the boilers and other machinery. The Director of Dockyards paid us a visit at the beginning of January to discuss the programe of new work for the next financial year with the principal officers of the yard. Although nothing has officially transpired, it is generally understood that a new vessel will be laid down in the autumn immediately after the *Neptune* is launched. The battleship *Bellerophon*, having carried out her machinery acceptance trials satisfactorily, was placed in No. 15 dock on January 9th for the finishing touches to be given to her. She has now been commissioned for service with the Nore Division of the Home Fleet. The refit of the *Hampshire* has been completed and on January 9th she proceeded to Portland to rejoin the First Cruiser Squadron. There is still, however, plenty of work in hand. There are the battleships *Dreadnought* and *Vengeance* and the cruiser *Berwick*, the refits of which are being pushed on as rapidly as possible, in addition to the battleship *King Edward VII.*, the flagship of the Commander-in-Chief of the Channel Fleet, which came in on January 8th. The work to be done to the *Dreadnought* is merely a general overhaul and the making good of any actual defects. She will not, therefore, be in our hands very long, neither will the *King Edward VII.*, The cooling apparatus of the latter vessel's magazines is to be brought up to date and various small improvements made. She is expected to come back later in the year for a thorough refit. The three Royal yachts are all undergoing an overhaul. The *Alexandra* will be ready early in February, and the *Victoria and Albert* about the first week in March, when it is expected she will be required to proceed to the Mediterranean to take the King and Queen for a cruise. The *Alberta*, Queen Victoria's favourite yacht, is having new boilers fixed and some machinery replaced, and she will therefore be in hand some time longer than the other two vessels. I omitted to mention last month that on the night of December 16th Torpedo boat No. 059 went aground on Bembridge Ridge, Isle of Wight, during exercises, the crew being taken off by a lifeboat. The salvage operations were somewhat hampered by the weather, but three days later it occurred to the dockyard officials to utilize two of the steel camels constructed for the salvage of the *Gladiator*, and these were towed to the spot. The cruiser *Essex* was also sent to assist. The operations were successful and the boat was floated off and brought into harbour early on the morning of Christmas Eve. Upon being placed in dry dock it was found that the hull had been badly torn. Vice-Admiral Robinson, the admiral superintendent, highly complimented the dockyard working party who got the vessel off. It was a particularly difficult job, as the vessel was lying broadside on the shore, in such shallow water that the dockyard appliances could not be got alongside her. The Commander-in-Chief, Admiral Sir Arthur Fanshawe, also made a congratulatory signal to the ships and departments. This stated that the zeal, ingenuity and skill shown by the officers and men of the fleet and dockyard in salving the boat in such difficult conditions reflected much credit on all engaged, and he had reported the same to the Admiralty. A few days before Christmas another mishap occurred, but this also happily was unattended with loss of life. As a steam pinnace belonging to the *Nelson* was leaving the tidal basin she came into collision with the pinnace of the *St. George*. The former boat was cut down to the water's edge at the bows and sank, but the crew were all taken off The services of the dockyard salvage staff were again requisitioned and they succeeded in raising the boat in less than an hour.

Devonport Dockyard.

Our new cruiser *Indefatigable* is to be laid down early in February, and the drawing staff in the Constructive Manager's Department have been very busily engaged in copying the drawings, overtime having had to be resorted to so as to get the work done. In preparation for the laying down, the excavation and foundation work in connection with the lengthening of the building slip is being pushed on. The foundations were laid when the slip was constructed, and the present scheme is being carried out by the Works Department. The dimensions of the new vessel appear to be slightly different from those I gave last month. They are as follows :—Length between perpendiculars, 555 ft. ; beam, 80 ft. ; displacement, approximately 19,000 tons ; specified horse-power, 45,000 ; and mean draught, 26 ft. 5 in. She will have tripod masts and three funnels, with a belt of armour running her whole length. The vessel's main armament will be the same as that of the *Invincibles*, eight 12-inch guns mounted in pairs in barbettes, while her anti-torpedo armament is to consist of twelve 4-inch guns and twenty-seven smaller weapons, and she will also have two submerged torpedo-tubes. A record has been made on the battleship *Collingwood*. The work of fixing the side armour was completed in the short period of three working days, which is believed to be a world's record, over 1000 tons of armour plates having been fixed to the vessel's sides in that short time. This rapid work is due in great measure to the electric travelling cranes, which worked without a hitch. It is confidently expected that our other battleship, the *Téméraire*, will have completed her official trials in readiness to be commissioned by the end of the financial year. The battleship *Bulwark*, of the Channel Fleet, has come in from Portland to remedy some defects in her gun sights. Upon examination of the gun slides it was found necessary to hoist the barbette guns out of the vessel. It is believed that the reason the *Bulwark* made such a low percentage of hits during the recent battle practice of the Channel Fleet was in some measure due to the faulty condition of her gun mountings. The sighting of the 6-inch guns of the cruiser *Donegal* is also being seen to. The fittings of her main armament of fourteen guns will be thoroughly tested while the vessel is in dock. The battleship *Mars* has been somewhat similarly treated, her barbette guns being fitted with improved sights. She leaves in a day or two for Berehaven to calibrate. The destroyer *Moy* met with a slight mishap just before Christmas, having gone ashore off Portland Bill during night operations. First aid was rendered at Portland by the repair ship *Assistance* and the destroyer was able to steam here at 12 knots. Although the scout *Skirmisher* accompanied her for safety's sake, the *Moy* did not require her aid. It was only found necessary to put right a few plates in the forward part of the vessel, which had been buckled and strained. Three other destroyers of the flotilla have come in for a refit, and the *Avon* has left. Engineer-Rear-Admiral North, of the Commander-in-Chief's staff, is now in possession of his new offices, which are situated at the west entrance of the North Yard, opposite the office of the engineer manager. The recording party, which has hitherto been under the orders of the engineer-captain of the Home Fleet, has now been placed under the orders of Engineer-Rear-Admiral North, and they are to move from the *Indus*, on board which was the office of the engineer-captain of the Home Fleet, and go to the Royal Naval Barracks, where office accommodation will be provided. The duties in connection with steam trials, acceptance of machinery, etc., have been transferred from the engineer-captain to the engineer-rear-admiral, and the former officer will, it is understood, move his office from the *Indus* to one of the vessels of the local division of the Home Fleet, probably the flagship.

Pembroke Dockyard.

A question was asked in Parliament shortly before the House adjourned for Christmas by Mr. Owen Phillipps as to what the cost would be of a dock large enough to accommodate a *Dreadnought*, and the depth of water necessary when the dock was located to enable such a vessel to make use of it when she was damaged. Mr. Phillipps doubtless has in view the expediency of constructing a floating dock for use at this port. As was anticipated, the First Lord preferred not to give an estimate, and merely replied that

the depth of water would depend on the design of the dock and the extent of the damage to the vessel which desired to make use of it. There is no doubt that a floating dock at this port would considerably add to our facilities and make the yard far more useful than it is at present. Perhaps in time one will be sent here. The mishap to the capstan of the cruiser *Defence*, referred to last month, has been taken as proof by some here that electrically-driven capstans are foredoomed to failure, but this is by no means the case in the opinion of experts. Care and judgment must, of course, be exercised when applying the brake and the machine must not be stopped too suddenly. It was found necessary to remove the driving shaft, which was twisted, and also a portion of the bed plate. The vessel will, no doubt, by the time this is in print, have gone round to Devonport to take in stores preparatory to joining the Fifth Cruiser Squadron in the Home Fleet at the Nore. Our other vessel, the *Boadicea*, will, it is confidently anticipated, be out of hand on March 31st. The cruiser *Bellona* will then be the only new vessel in hand. Boring operations for the propeller shafting are being proceeded with, and it is expected that the vessel will be launched on or about March 19th. The refit of the torpedo gunboat *Spanker* has given rather more work than was expected, it having been found necessary to replate her deck in parts and to lay new planking. She has been taken out of dock—as this work can be done just as easily afloat—to make room for the destroyer *Violet*, the refit of which is being proceeded with. Several attempts were made to bring off the six hours' recommissioning trial of the destroyer *Greyhound* on the completion of her recent refit, but on account of fog and unfavourable weather it was found impossible. The vessel was therefore sent to Devonport a few days before Christmas to give leave to her crew, as the authorities did not wish to keep them here during the festive season, and the trial will probably take place at that port. The coastguard cruisers *Fanny* and *Thrush* have arrived for their annual refit. The torpedo gunboat *Halcyon* is also being got on with. She is having her propelling machinery and boilers thoroughly overhauled and repaired. The cruiser *Medusa*, which has been prepared for calibration purposes, is to be permanently moored in Bantry Bay in connection with the calibrating range there, and will shortly leave to take up her duties.

Chatham Dockyard.

All the new vessels which were delivered here have now left us. The battleship *Lord Nelson* proceeded on January 12th to Sheerness to take up her duties as flagship of the Nore Division of the Home Fleet, in which she has replaced the battleship *Magnificent*, which has had her crew reduced to nucleus complement. The armoured cruiser *Inflexible* proceeded to Sheerness on January 9th to take in ammunition and coal, and on the 14th left for her experimental cruise, first of all going on to Bantry Bay to calibrate. From there she goes to the Mediterranean, where she will meet her sister ship the *Indomitable*, and the two vessels will then cruise together and continue the tests upon which the *Indomitable* has been engaged for some time past. The latter vessel is expected back to commence her duties with the Home Fleet at the beginning of March. The battleship *Triumph* having completed her refit left on January 2nd for a commissioning trial, and a week later rejoined the Channel Fleet at Portland. In addition to having her necessary defects made good, her fire control was brought up to date, and cooling appliances were fitted to her magazines. It is understood that she and her sister ship the *Swiftsure* will go to the Mediterranean. The battleship *Implacable*, upon whose refit nearly £60,000 will have been spent, is to leave early in February, and on the 2nd the captain and crew of the *Venerable* will commission her, as she has been selected to take the place of that vessel in the Channel Fleet. The *Venerable* will then be taken in hand for an extensive refit. She is a Chatham-built ship, and was launched in November, 1899. Commissioned two years later as flagship of the rear-admiral in the Mediterranean, she has since flown the flag of four admirals on that station. A year ago she was recommissioned for the Channel Fleet. The exact amount to be expended on her refit is not yet known, but it is sure to be a fairly large sum, and will go far towards keeping us fully employed until the end of the financial year. The *Shannon* has completed her refit and resumed her duties as flagship of the Fifth Cruiser Squadron at Sheerness. The *Minotaur*, which temporarily acted as flagship of Rear-Admiral Lowry, came in for her refit on January 18th. The cruiser *Diadem*, upon whose refit upwards of £50,000 has been spent, has been commissioned by a crew sent from Portsmouth, having been ordered to join the Home Fleet at that port as a special service ship. The new ocean-going destroyer *Ghurkha*, having arrived from the works of Messrs. Hawthorn, Leslie and Company, Hebburn-on-Tyne, has been commissioned by Commander Dawson for service in the Eastern Group at Harwich, in place of the *Locust*, which has joined the Nore Flotilla. The torpedo vessel *Vulcan*, which was employed for several years as depot ship of the destroyers in the Mediterranean, was commissioned on January 5th by Commander Johnson, lately commanding the Devonport Submarine Flotilla, for service as seagoing depot ship for the Nore Submarine Flotilla. The vessel has had nearly £70,000 expended on her to fit her for her new duties, having been fitted with appliances to effect any repairs to the vessels which will be under her charge. The Dürr water-tube boilers were taken from the cruiser *Medusa* and fitted in the *Vulcan*. It may be remembered that these boilers were specially fitted in the *Medusa* for experimental tests under the supervision of the Boiler Committee. It is expected that before long the Nore Submarine Flotilla will be considerably added to, and it will eventually be the strongest flotilla of any of the divisions of the Home Fleet. A well-known officer at this port, Engineer-Commander Rayner, of the *Acheron*, the training ship for stokers, has retired. Previous to joining the *Acheron* about two years ago, he served in the battleship *Prince of Wales* in the Mediterranean. While in that vessel a crank-head bolt broke and the port engine was wrecked, three men being killed and thirteen injured. For the coolness and decision he displayed on the occasion Commander Rayner was commended by the Admiralty.

Sheerness Dockyard.

Last month I referred to a rumour which had been in circulation to the effect that the Admiralty had decided to include a floating dock in the coming Estimates, and that the dock was to be placed at this port. A further rumour states that Rear-Admiral Ommanney, who was formerly captain of Devonport Dockyard, is to be appointed to supervise the arrangements in connection with the new dock, his first duty being to prepare estimates of the cost of a berth in the Medway for such a dock. It is to be hoped that the rumour is well founded, but at the time of writing no official announcement has been made of the Admiral's appointment. The new cruiser *Defence* has not yet arrived from Pembroke to join the Fifth Cruiser Squadron, but she is daily expected. The *Achilles*, whose place she is to take, will not go to Devonport, as was expected, but will be recommissioned for service in the Nore Division of the Home Fleet. She will later on be refitted, after which it is understood she will join the First Cruiser Squadron attached to the Channel Fleet. Indeed, it has been stated that eventually the sister vessels of the *Achilles* in the Fifth Cruiser Squadron—the *Natal*, *Cochrane* and *Warrior*—will go to the First Squardon when they are relieved by new ships. The torpedo gunboat *Jason* has completed her refit and resumed duties with the Home Fleet at the Nore, and another similar vessel, the *Speedy*, has come in for her refit. The *Cossack* of the Eastern Group of Destroyers, is being fitted with wireless telegraphy, and the other ocean-going destroyers are to be equipped in a similar manner as they come into dockyard hands for refit. One of the vessels, the *Tartar*, is in hand. The "River" destroyer *Rother* completed her refit on January 13th and went on to Harwich to rejoin the broad pennant of Commodore Charlton, a sister vessel, the *Boyne*, having come in for her refit a week previously. In addition to the above vessels, five other destroyers of the Harwich group are in hand undergoing refits—the *Usk*, *Ettrick*, *Garry*, *Panther* and *Erne*—while there are two or three at Chatham. The flotilla will not, therefore, be at full strength for some little time.

OTAKI.—In our last issue we referred to this vessel as belonging to the Union Steamship Co., of New Zealand. She is owned by the New Zealand Shipping Company.

LIVERPOOL ENGINEERING SOCIETY.

MR. A. R. T. Woods presided at the annual dinner of the Liverpool Engineering Society on January 14th, when there was a large and enthusiastic assembly of members and friends. The proceedings were of a most interesting character in view of the announcement of the splendid generosity of Mr. Alex. Elder, whose gift had made possible the establishment of a chair for naval architecture at the University of Liverpool, and the presence of the Marquis of Graham, who gave his experience on board the *Rattler*, fitted with internal combustion engines. Mr. J. G. Legge submitted the toast of "The Imperial Forces," and indicated the close relationship which existed between the training and discipline of the Navy and Army and that of the engineer. The Marquis of Graham, responding for the Navy, said he had visited Liverpool on a former occasion as a naval officer of the Auxiliary Forces. He had come in a gunboat which, though small in size, was of importance in association, as the gunboat in question had been tried in the tug of war with the paddle boat in the test between the paddle and the screw years ago, and had determined the issue of the question which was the better in favour of the screw. By a coincidence the test now at issue was

Mr. A. R. T. Woods.

the internal combustion engine as compared with the steam engine on the same gunboat, and in his opinion the *Rattler* had demonstrated, not only the possibilities but the probabilities, of this style of engine for marine propulsion. While the use of anthracite coal was meantime the best for marine service on account of the by-products, which although they could readily be dealt with in land installations, were awkward to deal with on shipboard, he was of opinion that bituminous coal, on account of greater economy, would be used ultimately as the system became developed by experience. As the *Rattler* was associated with the triumph of the screw in the earlier years of her history, so she might be associated with the triumph of the gas engine. Colonel A. M. Stuart, R.E., commander of the Mersey coast defences also responded, and thanking the company for the reception accorded to the toast urged that the local auxiliary forces should be supported and strengthened by all who resided within the area. "The Lord Mayor of Liverpool, the city, trade and port" were proposed by Mr. H. H. Grayson, who referred to the school days of the Lord Mayor while at Rugby, where he had shown that ability which later on still characterized him and led to his election to the civic chair. The early beginnings of Liverpool had been associated with the slave trade, and it was not creditable to think of it; later on, privateering was one of the prominent features during the disturbed seasons when wars were abroad; latterly the port had flourished by the pushing of trade and commerce, and had developed and expanded to its present great dimensions, and this was greatly due to the policy and efforts of the Dock Board and its officials.

The Lord Mayor, Mr. H. Chaloner Dowdall, who received an ovation on rising to respond, said that in all the work that affected the improvements of both the city and the port, the engineer was required, and according to the wisdom and skill he exercised, so did success follow. The city looked to and was grateful to the engineers for the great measure of success which had come to the various ventures in connection with the port, which depended upon the shipping interests, the details of which largely depended again on the way the engineers carried out the duties entrusted to them by the shipowners. The name of Lyster was well-known to them, both as that of the engineer of the Dock Board, and for the services rendered by the father to the Port of Liverpool and to the Society under whose auspices they had met. The Lord Bishop of Liverpool, who was warmly accorded a hearing in proposing the toast of the engineering profession, with which he associated Mr. Jas. Chas. Inglis, President of the Institution of Civil Engineers, said the development of the manly qualities was the natural outcome of such an education and training as the engineer had to undergo, and his work was calculated to bring the nations of the world into closer touch and to maintain their relationship in the peaceful work of commerce and trade. Mr. Inglis, in responding, said that the technical institutions were doing a good work in educating and developing the minds of the young engineers of the country to maintain those characteristics which were of the highest importance in maintaining the prestige of the nation in her commerce. The engineer was an empire builder, and to fit and qualify him for his work he had to begin at the foundation and learn the rudiments of that knowledge which would carry him on in his after life. He was glad to know of the encouragement given by the Society in the direction of educating young engineers, and he desired to record his warm appreciation of their policy. The toast of "The Liverpool Engineering Society," was proposed by Sir W. H. White, who said he was fully persuaded that the society had done and was doing an excellent work of the greatest value. The Society had been founded about thirty-five years ago, by the father of one who was present with them, Mr. Anthony Lyster, a matter of which the son had reason to be proud. The membership had reached 500, but he considered there was great room for it to increase in a community like Liverpool. He had advocated some fifteen years ago the establishment of a chair of naval architecture in connection with the University of Liverpool, and he had repeated that advocacy from time to time since then, as it seemed both right and fitting that there should be such a chair in their University, around which so many important shipping industries clustered. Thanks to the generosity of Mr. Alex. Elder, the establishment of the chair was within reach, and not only Liverpool, but the Kingdom was indebted to Mr. Elder, whose father's memory was also celebrated in the foundation of a similar chair at the University of Glasgow. He congratulated Professor Watkinson on the success which had crowned his efforts and he hoped that in the carrying out of the details in connection with the scheme, every attention should be paid, so that the results would be of the highest character, and meet with the greatest success. The President, in response, agreed that the chair of naval architecture was an important matter in which they were all interested, and they endorsed the terms stated by Sir Wm. White, and he also desired to thank Professor Watkinson for his efforts and hard work in bringing about such a success; he further thanked the donor of the noble gift whose munificence had alone made it possible, and the establishment of an experimental tank might be brought about through the instrumentality of others, on the encouragement given by Mr. Elder. He felt deeply conscious of the honour conferred upon himself by his fellow members in electing him to the position he held as responder to the toast, and he was assured that the society and the port with which it was associated would prosper and justify the goodly encouragement given by Mr. Elder. Mr. Duncanson proposed the toast of "The Guests," and referred to the value to members of the society and others in the community, of the addresses, papers and discussions, in connection with their society. The Mayor of Birkenhead responded on behalf of the guests. We have pleasure in reproducing a photograph of the President of the Liverpool Engineering Society.

INSTITUTE OF MARINE ENGINEERS.

AT the Institute of Marine Engineers on Monday, January 18th, the adjourned discussion took place on Mr. E. Shackleton's paper on "The gas engine and producer gas plant and its adaptability for marine work." Mr. John McLaren (member of Council) presided.

Mr. F. M. Timpson, in opening the discussion, asked if there was any efficient producer for bituminous coal. He commented on Mr. Shackleton's proposal to use either anthracite or coke, and stated that in many cases these would either be limited in quantity or unobtainable. He thought the use of a clutch for reversing would mean a heavy item of expense. In one case he knew of the cost of consumption, including upkeep, in a suction gas plant worked out at 1d. per I.H.P. per hour.

Mr. W. E. Farenden asked if the gas engine could be reversed, and also if any saving in space would be effected by its adoption.

Mr. Shackleton stated that anthracite could be sent out to the various ports, if necessary, and that gas coke could be obtained at almost any port. He thought the instance cited by Mr. Timpson must be an isolated one, as the makers of suction gas plants guaranteed them to give, on an average, 10 B.H.P. per hour for 1d. It was not proposed to reverse the gas engine, as it was not necessary, but there were several types of gas engines which did reverse. There were also, he said, several types of bituminous plant on the market eminently adapted for marine work.

Mr. J. Howie did not think the supply of gas coke would be abundant enough in small foreign ports to provide fuel for ships dependent upon coke. He thought the marine engine should, necessarily, be a reversing engine, and deprecated the use of auxiliaries for that purpose.

Mr. J. Newton thought the chief difficulty with the gas engine was in relation to the gas itself, and it was often a question of successful running or absolute stoppage, and Mr. W. Calderwood asked how it was proposed to overcome the difficulty which would be experienced through the necessity of altering the air adjustment to suit the various qualities of gases used. Mr. J. Veitch Wilson alluded to the diminishing supply of coke and the certainty of a rise in price if the demand were increased, but thought that difficulty might be overcome if anthracite only were used and carried out to the various ports. It was quite probable that anthracite might be discovered in various other countries. He also spoke of the suitability of the oil engine, and referred to the fact that there were oil engines made which would burn coal dust and the heavier crude oils.

Mr. B. King asked whether it would be necessary to stop the engine to clean the internal parts in a ship making long voyages of about six weeks' run.

Mr. W. Watson referred to the increasing cost of anthracite and also said that if the engine was adapted for anthracite or coke, the producer would require to be built large enough to deal with the coke.

The Hon. Secretary said the reversing arrangements with the gas engine, as he had seem them, would require to be improved upon if the principle were adopted for large vessels. Internal combustion engines had been applied to barges and apparently even in these vessels many of the difficulties had not been overcome. He had been on board the *Rattler* and enjoyed the privilege of examining the plant, which impressed him favourably on the whole, and he was looking forward to receive more information on the subject, as other members were; for this they were dependent upon those who had experience with the type of engine under discussion. The author had an impression that the marine engineer was not favourable to change, but it must be remembered that it was the objections from one standpoint which brought about perfection in the other. When these experiments proved the economy and efficiency of the engine it would doubtless be applied more extensively. He understood the two most economically run central electricity stations in the kingdom were driven, not by internal combustion, but by steam. The hydraulic drive, had been favoured in certain instances, and he asked if the author could give data respecting its application. The magnetic drive, which he had seen in experimental stage, was another means which might be used with the internal combustion engine, and he hoped a paper would be read on that subject. to the members of the Institute on April 5th.

Mr. A. H. Mather thought it would be of great assistance if a recorder, similar to those used for the analysis of flue gases, could be fitted to tell the quality of the gas used for the gas engine, so that it could be regulated accordingly.

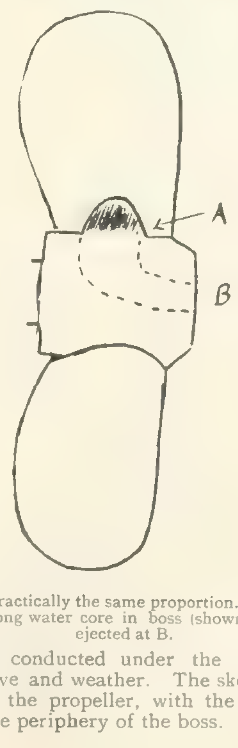
Mr. W. P. Durtnall thought many of the difficulties raised with regard to the starting and non-reliability of the gas engine were due to want of experience. He did not think the engine should be made to reverse, but that this should be accomplished by means of some system of gearing.

In replying, Mr. Shackleton said no difficulty in starting would be likely to arise in an up-to-date plant. As to fuels, it was a simple matter to change over from coke to anthracite, and the anthracite could be shipped to various ports, if necessary, as ordinary coal was at present. The engines could be run for twelve weeks or more without necessitating cleaning. With regard to space, even with the bituminous plant, which was twice as heavy as the suction plant, there would be a saving of 20 per cent. The competition from other countries would keep down the price of the anthracite. For reversing he preferred the coil clutch for powers up to about 3000 horse power, and the electrical drive for powers over that. The objection to the oil engine was the difficulty which was experienced in burning oils which contained more than 16 per cent. to 20 per cent. of pitch. He attributed the failure of the gas engine in some electrical stations to the want of attention. The abundance of water for the scrubbers under marine conditions would ensure thorough cleansing of the gases in the case of bituminous plant and would thus reduce the cost.

Votes of thanks were accorded to Mr. Shackleton and to the chairman.

In our March, 1908, issue we described and illustrated a novel type of screw propeller, which has been since tested on a small vessel against an ordinary propeller of the same weight and dimensions, with the following results, over a mile course in each case:—

Ordinary Propeller.			Patent Propeller.			
Speed of boat	Speed of engines	Slip	Speed of boat.	Speed of engines.	Slip.	Gain
7·35	12·5	[illegible]	7·39	[illegible]	[illegible]	4
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	30·8	3·2
6·18	9·02	[illegible]	6·12	8·57	28·5	2·1



Hole A and B are practically the same proportion. Hole B is elliptical. Water flows in at A along water core in boss (shown by dotted lines), and is ejected at B.

These trials were conducted under the same conditions of steam, throttle valve and weather. The sketch shows the form and peculiarity of the propeller, with the hole shown dotted from the face to the periphery of the boss.

ELECTRICAL NOTES.

(From our Own Correspondent.)

Turning Power of Motor.

WHAT is a somewhat difficult problem to understand is the effect of current upon an armature and how the revolution is produced. It is a well-known fact that when no current is in a wire the lines of force pass evenly across an air space, but directly a current comes the lines of force that would have otherwise travelled evenly in circles become less above and augmented below and we get a motion. Other conductors replace those lost and the action becomes continuous. The action of one pole is to retard the motion and the other to increase, but the resultant plotted out is to induce the motion in the one direction. A parallelogram of forces shows this to be the case in a very clear manner.

Inspection of Motors.

Taking a shunt-wound machine, the brushes should first be placed central and the machine run light and then up to full load. The machine must have its normal speed and the range, as it is called, of the brushes be taken at which there is no sparking. It is necessary to avoid what is called reactance voltage, which gives rise to sparking at the brushes. This is done by giving lead to the brushes, and if we give backward lead we assist commutation. With fixed lead the voltage induced in the short circuited turn is not proportionate to the current, and therefore not equally effective at all loads. We have also to note that the armature bears equally on both bearings, the magnetic pull having the effect of putting it out of line. By moving the liner we may prevent this, or we may have to alter the bearings themselves.

Incandescent Lamp Defects.

In a paper read some time ago before one of the societies the writer summarized the defects attendant on carbon filament lamps, and gave it that the three principal ones are spotted filaments, loose caps and poor vacuum. For the detection of the first he proposed to run the lamp at low voltage, giving a red filament and then the spots can be seen. For loose caps there is no difficulty in finding, but if existing the leading-in wires will come together inside the cap and cause a short circuit, which will destroy the lamp or blow the fuse. A poor vacuum means short life and considerable damage to the circuit on which it is burned, and a ready means of testing is said to be to tap the bulb, and if the filament vibrates for some time and comes to rest gradually then it may be assumed the vacuum is good, and *vice versa* if less mobile. Supposing the bulb insufficiently exhausted and enough gas left to conduct across from one platinum wire to another, the normal current of the lamp will be only a fraction of the total which may be passing over the leading-in wires. If lamps are subject to over-voltage the candle-power emitted decreases, and under-voltages increase the life. Candle-power, current consumption and length of life are all proportionate to the voltage. If the voltage be increased 4 per cent. above normal the candle power increases 25 per cent., but the life of the lamp will drop to 45 per cent. of what it would have been if the voltage had been steady at its proper figure. On the other hand, if the voltage drops 4 per cent. the candle power will be only 80 per cent. of normal, while the life will be increased to 230 per cent. of normal. The lesson to be learnt from this is that it is most wasteful to permit any fluctuations from normal whatever, as a large loss can be shown to result therefrom. Metallic filament lamps are another story, the consideration of which must stand over for the present.

Crane Controllers.

The controller, as its name implies, controls the various motions and consists of a combined starting, reversing and regulating switch, and as it is handled sometimes by inexperienced men, requires to be of the very best design for the purpose. The controllers are of three general types, each of which finds favour. Perhaps the drum type is as suitable as either, because it can be used where frequent reversals take place and there are intermittent and variable loads. The starting handle is connected to an insulated drum free to revolve, on which are secured contact strips, and as the drum is revolved either way it makes the requisite connections with insulated contact fingers attached to the casing. The apparatus is totally enclosed, which is an advantage. No current carrying parts are exposed and the various connections for different systems of control can be more easily arranged for from the peculiarity of construction.

Wireless Telegraphy.

The new branch of science was enabled to make full use of its powers on the occasion of the recent disaster in Italy. French warships, and no doubt others, communicated to head-quarters their reports when the cables were broken by the earthquake. Apart from the relative difference in cost, therefore, this is a case which proves unmistakably the value of the new system, as it must have been the only means of communication open, and therefore of the highest possible value commercially. At the new Post Office Station the rates are said to be 8d. per word, which shows the nature of the advance made by recent developments.

JUNIOR ENGINEERS.

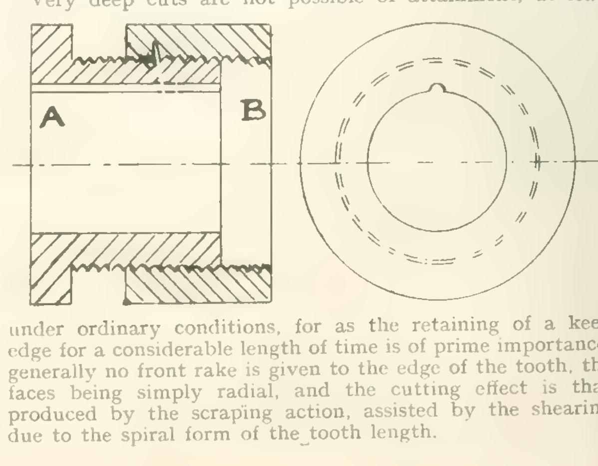
Milling.

THE principal defect of the planer, slotter and shaper is that due to the idle stroke, thus making this a point of vantage for the milling machine in a comparison with these tools; further, the actual working period of the tool in the planer is about two-thirds of the total time, while each tooth of the milling cutter is only employed for about one-sixth of a revolution, even with heavy cuts, albeit this is slightly set off by the higher speed of cutting; thus there is more time available for cooling the steel, by means of the lubricant, between the cuts of each tooth. Sufficient time has also to be given, before the commencement of each cut in the working stroke of the planer, to allow for feed traverse, whereas the milling machine can usually take the full width at once, either by using a long single cutter, or a gang of shorter tools, thus effecting a further saving. *A propos* of the wide cut it has been found that comparatively narrow and deep cuts are more economical of driving power than wide and shallow cuts, for the same weight of stock removed.

On the other hand, the first cost and maintenance of the milling cutter is far in excess of that of the plain-forged tool, and as the efficiency of the cutter is greatly diminished by the dulling or eccentricity of the teeth edges, these become important considerations in a relative comparison.

In so far as the plain machining of flat surfaces of rough forgings and castings is concerned, the miller has no advantage, is in fact inferior to the planer, but where a large number of similar small objects are machined on one or more faces, especially where they can be assembled separately or collectively in a chuck attachment or jig, the milling cutter shows its special merit, and this is accentuated if the stock to be removed is of small amount, and a well-finished surface is required. The slow and steady movement of the table can here also be utilized, for the parts can be bolted down or secured in vises or chucks along the table, while the machine is in operation, and similarly removed without loss of time.

Very deep cuts are not possible of attainment, at least



under ordinary conditions, for as the retaining of a keen edge for a considerable length of time is of prime importance, generally no front rake is given to the edge of the tooth, the faces being simply radial, and the cutting effect is that produced by the scraping action, assisted by the shearing due to the spiral form of the tooth length.

There is still some diversity of opinion as regards the best shape and pitch of tooth, which is partly due to the wide range of work covered by the tool; owing to the necessity of keeping the outfit within moderate limits, and requiring a considerable degree of universality in one cutter, from fine finishing of brass to heavy cutting of steel. Mr. G. Addy gave as a rule—Pitch of teeth $= \sqrt{\dfrac{\text{Dia. of cutter.}}{32}}$

or as given by Mr. Gray—Pitch of teeth $= \dfrac{\text{Number of teeth}}{100}$

These give cutters of moderately fine pitched teeth, and a front rake is employed of about 10 degrees, with a cutting angle of 70 degrees. The coarser pitch cutters have, in some cases, little more than half this number of teeth, and under similar conditions it is found that the power required by the coarse cutter is considerably less, due to there being fewer teeth cutting at the same instant, although the material removed per tooth is actually greater. The faces of the coarsely pitched teeth are usually radial, the cutting angle of 85 degrees being obtained by grinding a facet of one-sixteenth inch broad, across the tip of the tooth at an angle of clearance of 5 degrees, the main body of the tooth being about 60 degrees. These cutters are more suitable for heavy cutting, such as gear wheel blanks, there being more room for the freeing of the chips, while the fine pitch tool is better adapted for finished surfacing.

In profiling work, with either single or gangs of cutters, the coarse type is almost universally used, as, especially with the single-formed cutter, the first cost and upkeep are high, and a strong tooth is necessary to avoid breakage with the consequent expense of renewal. So much is dependent on the cost of maintenance that inserted teeth are being more widely used, a practice which has had considerable impetus from the introduction of high-speed steel. With these tools a body of mild steel or cast iron is employed, having a series of holes formed in its periphhery, in which small cutters are inserted and secured with locking pins. These small teeth are more easily hardened, the cost of renewal is trifling, and the losses due to the cracking and burning of a large body of costly tool-steel, are reduced to a minimum. This is in some respects a reversion to the gang tool, in which a number of short tools are similarly inserted in a large disc some feet in diameter, an appliance which, fitted on a vertical, rotating arbor, is still in use doing good work, *vice* the planer.

The considerations that affect the speeds and feeds of operation are so varied that the personal equation is largely a factor in the output of the machine, the style and state of the teeth, the degree of accuracy and finish required, the quality and nature of the material, and the rigidity of the machine and job, all have an important bearing on the economical rate. As a general rule, the speed of cutting is considerably higher than with other tools, partly due to the more effective cooling of the steel, and partly due to the lower stress which it is advisable to put upon the teeth of the cutter, and as usually the amount of stock to be removed is small, and a fine finish is required, the general practice for jobbing work is fine feed and fast speed, the heavy cut being employed where coarse pitch cutters are used on specialized operations, and sufficient rigidity of the arbor is provided to prevent chattering.

The direction of feed is such, that the material is moved in the opposite direction to that of the tooth acting upon it, so that a constant pressure is maintained between the job and the tool, thus avoiding any tendency to chattering, and preventing unequal feeding due to back lash on the feed screw or gearing; also as the teeth are always biting on machined stock, and merely lift the skin of the rough surface at the end of their cut, there is less liability to dull the edges than if the material were fed into the cutter, and the teeth struck the hard surface at the commencement of each cut.

As the maintenance of keen edges on the teeth is a factor of such consequence, and as the skin of cast iron is particularly severe upon the cutters, due to the dulling effect of the hard, vitrified sand adhering to the surface, as well as to the hardness of the somewhat chilled skin, means are frequently adopted to lessen the damage; the tumbling and scraping of the casting performed in the foundry is not sufficient to remove all the sand, and hence pickling in a solution of one part commercial sulphuric acid in five of water is employed; the articles are immersed in this for a few minutes, removed, and left to dry, afterwards being rinsed with warm water and washing soda. To soften the skin the castings are frequently annealed in iron oxide, with good effects; both of these processes, not necessarily peculiar to milling work, being in common practice where high machine efficiency is aimed at.

For sharpening the cutters grinding is almost universally adopted, with an oil stone finish for the finer types; a few light passes across the face of each tooth is all that is necessary, provided the cutters are kept in good condition, and when the facets become too narrow or the edges chipped, the cutter is trued up on a mandrel, grinding the periphery and reforming the teeth backs. As this latter is a somewhat lengthy process, and as the dull cutter is more liable to severe damage, it becomes expedient to sharpen often and little, rather than waste power squeezing the material under a blunt tool and rolling a burr out on either side of the job, leaving depressions at intervals along the surface and having to reduce the cutting speed or spoil the temper of the tool.

The cutters should be of the correct bore to suit the arbor, on which they should be a sliding fit, to avoid any eccentricity of the teeth with attendant loss in efficiency. The keyway in the arbor extends the full length, and the cutters are secured from rotating by means of steel feather keys, either of circular or square section; in the latter case the keyway in the cutter is filleted in the edges to prevent any possibility of starting a crack during the hardening process of the tool. Steel wire is used for the feathers, of the proper size, square or round as the case may be, and anything softer should not be used, as it may fail by shearing, with disastrous results to the cutter. The spaces along the arbor, between the collar at the driving end and the cutter, and between the cutter and the locking nut at the outer end, are filled up by slipping on steel washers of various lengths, the whole being jammed hard up by the locking nut.

Where two or more cutters are placed upon the arbor a fixed distance apart, as in the simultaneous machining of two surfaces, such as square or hexagonal heads on pins or the sides of nuts, a washer of the exact length is required, and as these distances necessarily vary greatly, difficulty in quickly selecting the right washers may occur. A handy form of adjustable distance piece is shown in Fig. 1 above, this is made in two pieces, the part A being bored to suit the arbor, and having a feather way cut to prevent it rotating under vibration, the outer diameter is reduced, as shown, and screwed, upon which the part B is fitted, so that the overall length can be varied to suit; a thin locking ring may be also fitted, but this is not necessary if the end nut is tight. For small sizes a gas thread is suitable; usually, however, the cutters used for this work are of large diameter—6 or 7 inches—and the distance piece may be 3 or 4 inches diameter, to suit the plain part of the side of the mill in order to give more stability.

When milling cast iron, brass or gun metal, the cutter is run dry, as the chips clear themselves better, and the table and strainer are more easily kept clear. For wrought iron and steel, however, a lubricant of some nature is necessary, both to cool the cutter and ease its work, while assisting in the removal of the cuttings; soft soap and water is cheap and effective, oil alone is also used, but a very good lubricant can be made up with oil, soft water and washing soda, the oil and water affording lubricating and cooling properties, the soda being an antidote for rusting, always a recommendation whether the surfaces are afterwards scraped or not. Any extra cost of lubricant is of little moment, as with most machines efficient catching and straining facilities are provided to return the fluid to a collecting tank, whence it is pumped back into the supply pipe.

It is worthy of note, that the heaviest milling is done on the vertical type of machine; this is due mainly to the greatly increased rigidity of the vertical arbor, as a massive head can be arranged for, and if necessary a steady arm can be brought into use, so that the mill is strongly supported a few inches from its work. When working with a tool thus, cutting on its under side, the stresses induced are thrown upon a short strut, which provides a better driving force than that obtained from the overhung beam of the horizontal knee type of machine. The machining of the ports in slide valve faces and piston valve chambers, as well as of the valves themselves, is illustrative of this practice, operations

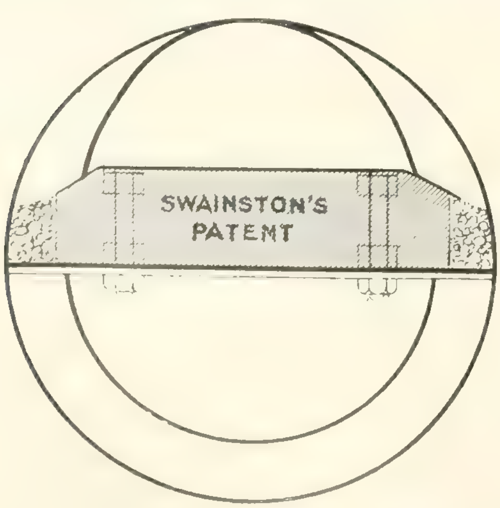
which are frequently performed by means of vertical rymer mills. Although the allowable stress on the under side of the vertical tool is large, yet the stress on the side of the rymer must be reduced, and the work brought close up to the steady arm, as otherwise, with a heavy cut, the bending effect on the tool may cause it to snap or chatter. Where work of this nature permits it is better to fix the steady arm below the tool, and extend the arbor into a bush fitted in the arm, thus giving a double support to the tool. The rymers used have both straight and spiral flutes, the latter being more suitable for traversing work, with the spiral angle such that the end pressure produced is downwards against the work and upwards against the tool.

BOILER ROOM EQUIPMENT.

II.

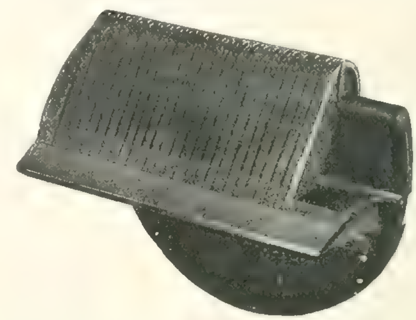
THE so oft quoted truism 'that a good start is half the battle' is not so entirely worn threadbare that it can be picked to pieces, and its applicability is undeniable in the creed of the fuel economist, where, in the forefront of the utilization of coal, the furnace is the commencement of all things. That the stoker, trained though he be, should be always so careful as not to damage the little brick wall built up so neatly at the back of the furnace, implies a tribute of praise when labouring under the conditions that firing and cleaning impose in the marine stokehold, with the air temperature alone high up in the three figures, and the stalactites of a Bulli coal hanging in brilliant clusters from the bars. With the draught efficiency so largely dependent on the state of this bridge, it is worthy of much importance that it should be maintained in a tolerably good degree of soundness, and it becomes no easy matter to so retain a good built bridge till the end of a long voyage, or under circumstances that do not permit of sufficient attention to its well-being. The brick bridge has done and is doing good work, but naturally, where its shortcomings have been much in evidence, improvement has been induced. Other considerations that simply long maintained efficiency require attention, ease and celerity of removal, and renewal for inspection and refitting purposes; first cost, upkeep, carriage of material, and assistance to prevent the dead fire at the back of the grate due to the accumulation of coke or clinker, either as a protection for the bridge or as owing to incomplete combustion, these must all be taken into account, while still retaining a refractory wall in order to avoid cooling of the gaseous products on their way into the combustion chamber.

SWAINSTON FIRECLAY BRIDGE BLOCK. A front view of the arched type of this attachment is shown in Fig. 1, and



consists of a solid block of fireclay, of rectangular section, having dove-tailed ends for the filling in of packing between it and the furnace walls. Two square-headed bolts are passed through the block, which secure it to the end plate at the back of the furnace bars; an efficient bridge is thus obtained, compact, easily handled and easily fitted, which can be reversed when worn away on one side, and sufficiently non-friable to have good lasting properties.

STURROCK FURNACE BRIDGE. This bridge is of a more complete construction and, as seen from the illustrations in Fig. 2, consists of a number of arched cast-iron bars, supported on a bulbed upright plate and extending across the back end of the furnace, sloping thence down to the firebars. Air spaces are provided between the sloping sides



of the bars, and also at the crown of the arch, so that warmed air enters the furnace from the under side of the bridge, to assist in securing complete combustion for the full length of the grate, and aiding the prevention of smoke and soot. The bridge is easily removed and replaced, the bars being separately assembled, and forms a compact structure, strong to resist damage.

The importance of obtaining good circulation in both fire and water tube boilers needs neither emphasising nor proof, for it has become one of those maxims of practice learnt as first principles. Although not an inherent defect in the water tube boiler, the obstinacy with which the Scotch type insists on keeping cool on its under side has resulted in the exploitations of the many ideas to prevent the straining and sweating endured, and overcome that *bête noire* of the inspector—pitting. When raising steam, or lying under banked fires, the donkey feed pumps can be kept going, drawing from the dead water at the bottom of the boiler and discharging at working level; this, however, is not practicable under steaming conditions, even if the pumps are available, as something more than ordinary plunger packing is necessary to stand the proportionately higher temperatures for any length of time. One of the chief factors determining the adoption of any appliance in the mercantile marine is that the care and attention required to be bestowed upon it must be a minimum, and this applies to methods for inducing circulation as to other things. One of the simplest attachments for this purpose was put into service by Mr. J. Macartney (Sydney), and consisted of fitting sheet iron casing plates across the spaces, back and front, between the combustion chambers, and between the chambers and the shell, from a few inches below the working level down to within a few inches of the furnace bottom. By this means water pockets were formed round the chamber sides, so that the water was induced to rise as the boiler warmed up, drawing the cold water upwards from the bottom of the boiler, and creating circulating currents immediately the fires were lighted. Provided attention is given to the fitting of these plates no great hindrance is caused when they require removal for inspection purposes, clipping to the stays and tubes being the best method of attachment.

We are informed that the Dexine Patent Packing and Rubber Co., Ltd., of Stratford, have secured a contract with the Cunard Steamship Co., for the supply of Dexine Conical Gauge glass rings for the year ending December, 1909, also with the Orient Royal Steam Navigation Co., for the supply of Dexine H.P. Jointing and Manhole Joint rings.

INDIAN PREMIUM FOR ENGINEERING SUBJECTS.—The Council of the Institution of Civil Engineers, after consideration of the Papers on Indian engineering subjects published in the Proceedings for the past Session, have awarded the "Indian Premium" of The Institution for 1908, of the value of £33, to Mr. F. P. Anderson, M.Inst.C.E., for his Paper on "River Control by Wire Net-Work."

Industrial and Trade Notes.

THE CLYDE AND SCOTLAND.

(*From our Own Correspondent.*)

New Contracts.—The New Year holiday period commenced in the various Clyde shipbuilding and engineering establishments on the 1st January, and the stoppage lasted as a rule until the 11th. On account of the depression, however, the holiday period in the case of some firms and of some branches of trade was of a more extended character than usual. About the beginning of the New Year, while Clydeside yards were inoperative owing to holiday-making, and coming quite as a New Year gift, it was announced that Sir Donald Currie & Co., managers of the Union Castle Mail Steamship Co., Ltd., had entrusted to the Fairfield Shipbuilding and Engineering Co., Govan, and to Messrs. Barclay, Curle & Co., Whiteinch, the substantial order of no less than 20,000 tons of new shipping. At the same time the announcement was made as to Messrs. Harland & Wolff, of Belfast, having received a considerable order from the same source. The Fairfield Company's commission is to build a twin-screw mail steamer of about 13,000 tons, and that of the Whiteinch firm an intermediate steamer of 7000 tons, both, of course, being for the Company's well-known South African service. The Belfast firm's order, it may be added, is for a steamer similar in size and design to the vessel placed with the Fairfield Co. The Fairfield Co. were building for Messrs. Donald Currie & Co. as far back as 1879, when they constructed the first *Kinfauns Castle*. In the following year they built the *Garth Castle*, and in 1881 the *Drummond Castle*. The first of these three was of steel, but the two latter were of iron, as also were the *Hawarden Castle* and the *Norham Castle*, built in 1883. From these there was a blank until 1890, when the *Dunottar Castle* was built at Fairfield. In 1891 the Company renovated the machinery of the *Hawarden Castle*, the *Norham Castle*, the *Warwick Castle* and the *Conway Castle*; in 1894, they built the *Tantallon Castle* and the *Arundel Castle*; in 1896 the *Dunvegan Castle*, the *Tintagel Castle*, and the *Avondale Castle*; in 1897, the *Carisbrooke Castle*; in 1899 the *Kinfauns Castle* and the *Kildonan Castle*; and in 1893 the *Armadale Castle* and the *Durham Castle*. Of the Union Castle Line's present fleet Messrs. Barclay, Curle & Co. built the *Braemar Castle* in 1898, the *Aros Castle* and the *Corfe Castle* in 1901, the *Cawdor Castle* in 1902, the *Cluny Castle* in 1903 and the *Dover Castle* in 1904.

Messrs. William Denny & Bros., Dumbarton, are to build for the Irrawaddy Flotilla Company two paddle steamers for river service. Messrs. William Hamilton & Co., Ltd., Port Glasgow, have received an order from Messrs. J. Hardie and Co., 11, Bothwell Street, Glasgow, for a steamer of 7000 tons carrying capacity. The vessel, which will be in the highest class of the British Corporation Registry, will be fitted with electric light and the propeller is to be of manganese bronze. The dimensions are as follows:—Length, 390 ft.; breadth, 52 ft.; and depth, 28 ft. Engines will be supplied by Messrs. David Rowan & Co., Glasgow. The Caledon Shipbuilding and Engineering Co., Dundee, have received an order for a new vessel from the Dundee, Perth and London Shipping Company. The dimensions of the new vessel are:—Length, 240 ft.; moulded breadth, 32 ft.; moulded depth, 17 ft. 6 in. Her deadweight tonnage is 1200 and her speed 12 knots. The new steamer is to be engaged in the Company's Dundee to Hull trade. The Montrose Shipbuilding Company have received a contract from East Coast owners to build a steamer capable of carrying 400 tons.

Wages Reductions.—The result of the voting of Clyde members of the Amalgamated Society of Engineers on the question of accepting or rejecting the reduction of wages intimated some time ago by the North-west Engineering Trades Employers' Association, was announced on January 19th. For accepting the reduction the voting was 2647 against 1402, being a majority for the reduction of 1245. The reduction is to be a farthing per hour or a shilling per week (according to the practice in the different shops) on time rates and 5 per cent. on piece rates. It was at first proposed by the employers that the reduction should take effect at the beginning of December, but it was postponed pending negotiations. The new rate of wages will continue undisturbed for six months, and any subsequent alteration will be subject to the usual month's notice.

The New Orient Liners.—The launch of the Orient liner *Osterley* from the stocks of the London and Glasgow Shipbuilding and Engineering Co., Ltd., Govan—the third of three similar vessels simultaneously placed with Clyde builders—has an additional interest on account of the fact that it is the largest vessel ever built further up the Clyde than Fairfield. It is also interesting as being the first launch to take place from the London and Glasgow yard since 1907. Although about two months later in launching than the other builders, the London and Glasgow boat will be completed well within the contract time, the delay being due to the fact that the firm have no fitting-out dock of their own. After a certain number of days dues are charged on vessels fitting out in the harbour, so that it was to the firm's interest to keep the vessel on the stocks as long as possible.

Yarrow Productions.—Messrs. Yarrow & Co., of Scotstoun, about mid-month received intelligence of the arrival at Rio de Janeiro, after a most successful voyage, of the *Para*, the first of the ten destroyers ordered by the Brazilian Government. The *Para* averaged from 12 to 14 knots, and on the way called at Falmouth, Corunna, Vigo, Lisbon, Las Palmas, St. Vincent and Bahia. She was navigated entirely by Brazilians, the only Britisher on board being Messrs. Yarrows' guarantee engineer. The report from each port touched at has been highly gratifying, the captain having expressed himself as greatly pleased with the sea-going and steering qualities of the vessel. Very rough weather was experienced in the Bay of Biscay.

Fraserburgh Pontoon Dock.—On January 7th, the new pontoon dock built for the Fraserburgh Harbour Commissioners by Messrs. Swan, Hunter & Wigham Richardson, Wallsend-on-Tyne, was formally put to work in presence of many hundreds of onlookers. The first vessel to be floated on to the pontoon was a local steam drifter, the s.s. *Queen*, belonging to Mr. James Hay, Fraserburgh. The dock, which was in charge of Mr. Thomas Moffatt, superintending engineer, worked admirably, and was raised in twenty minutes. It has a lifting capacity of 400 tons, and the total cost of the pontoon, including preparation of site, has been £8500.

THE TYNE.

(*From our Own Correspondent.*)

A New Treaty of Peace.—The text of an agreement to last three years, and which is confidently expected to prevent disputes between employers and employed in the shipbuilding industry during that period, has been published, and has given complete satisfaction to nearly all people in the areas involved. For ourselves, we hail the agreement with pleasure as a harbinger of goodwill for the future in districts where hitherto there has been intermittent war. By this agreement the trade unions have scored, as the leaders themselves point out to the members in a circular addressed to them, in which ratification of the agreement is asked for. Most certainly the recognition of the Unions has been made more emphatic than ever it was before, and in this way some unions that were not particularly robust, have been temporarily bolstered up. The ratification above spoken of will no doubt be given with acclamation in the branches, and the agreement may even now be accepted as a settled thing, which result, we think, should give a fillip to trade in the sense that shipowners of a speculative turn will have their confidence made firmer. The circumstance, however, that laid-up tonnage is showing increase rather than diminution, and that artificial remedies are being suggested to make shipowning even moderately remunerative, makes the outlook dubious, and certainly does not tend to strengthen the hope of an early change for the better. Low prices for tonnage —much lower indeed than the trade unions are willing to accept for their members—would constitute the best stimulus to shipbuilding in this country; for it is necessary to cut under the foreigner in the matter of price, and to outpace him in the matter of delivery, before we can get foreign ships to build, or make sure of the orders that may be given out for

home requirements. One good thing achieved by the present agreement is that in future all representatives at conferences for the discussion of points of difference, must come with full power to settle, and there will be an end to those abortive meetings which in the past have caused so much inconvenience and loss of valuable time; besides being the means of engendering considerable ill will.

State of Work in the Shipyards.—At Messrs. Armstrong, Whitworth & Co.'s Elswick yard appearances are indicative of the maintenance of a fairly busy time over the spring months, but at the Company's Low Walker yard a different state of matters is to be noted, two or three of the berths being now vacant. It is rumoured, however, that the Company are in negotiation for the building of some steamers of a special class, and should the rumour prove to be well founded the empty berths will soon have occupants. Messrs. Wood, Skinner & Co., of the Bill Quay yard, are still keeping busy, and at Messrs. Dobson's there is a considerable amount of work in hand. The Neptune yard, Low Walker, and also the yard at Wallsend are looking somewhat bare, and both the large yards at Hebburn, on the opposite side of the river, have most of the building berths unoccupied. The graving docks at the latter centre continue to be well engaged, and through this fortunate circumstance a proportion of the operatives are still provided with employment. It has been announced that the management of the Northumberland yard have recently booked a couple of orders, and the Tyne Iron and Shipbuilding Company have, it is stated, also succeeded in obtaining some work. Messrs. Readhead have a couple of vessels on the stocks, and the small yards at Shields are kept going, though not to the extent of having all the berths occupied.

The Palmer Company's Yard.—We regret to say that no very marked signs of improving business are as yet apparent here, and a large proportion of the splendid working accessories at this establishment—which is still the leading yard on the Tyne—are for the time being unproductive. The forging department, however, is more active than it was, and in this fact lies some little hope for the future.

Ship Repairing.—The Smiths' Dock Company have obtained the contract to repair the Anglo-American Oil Company's steamer *Swanee*, which through having been ashore has been somewhat seriously damaged. The firm have also contracted to repair the steamship *Lydford*, and have received other contracts of minor importance. The Commercial Dry Dock Company, Jarrow, have also several boats in hand for repairs, and Messrs. Brigham & Cowen, at the entrance of the river, have had their graving dock continuously occupied lately.

Engineering Work.—The long-talked-of scheme for amalgamation of engineering firms, in which by the way we never had much faith, appears to have fallen through, and it is not likely to be revived within the limits of the present generation, if ever. The object of the scheme was, we believe, to cheapen production by specializing the work, which process, we take it, had to be accomplished by confining each firm to some special department of engine manufacture. It is easy to see that this proposal would be unacceptable generally, as few firms would care to sink their individuality, and particularly those who hold a distinguished position in the engineering world. That production must be cheapened, if England has to hold her own in the markets of the world, there can be no question of doubt, but the cheapening must be effected in a less complex and more direct manner, by economies in labour expenditure and reductions in standing charges. The electrical engineering works of Messrs. J. H. Holmes and Co. are keeping moderately well employed, ship lighting continuing to constitute a substantial proportion of the work in hand. The works devoted to the manufacture of steamship auxiliary machinery do not show improvement.

THE WEAR.

(*From our Own Correspondent.*)

Some Shipbuilding Orders.—An order for two medium-sized steamers for a German firm of shipowners has been placed with Messrs. Pickersgill through Liverpool agents. Messrs. Osborne & Graham have also booked a couple of orders and are already preparing berths for their reception. For some time past the firm have, by the aid of apprentices, been keeping the yard going on short time, but it is probable that full time will soon be resumed. Messrs. Priestman have a vessel in an advanced stage of construction, and a smaller one on which plating work has been commenced. The Southwick yard of Messrs. Robert Thompson & Sons is still busy, and is about the only shipbuilding establishment on the river to which this description can be correctly applied. Messrs. John Crown & Sons have received an order for two steamers of medium size, and having already had a vessel or two in hand, are now likely to become busy.

It is reported that Messrs. Doxford have received an order for two "turret" steamers of good size, and appearances in the yard are already indicative of increasing activity. A fourth berth is being prepared at the North Hylton yard, the existing building space being fully utilized. This is a healthy sign so far as this yard is concerned.

The North Sands Yard.—This establishment, which has been kept steadily going during the winter months, now appears to be slackening somewhat, and employment for the operatives is not so continuous as it has been. Slackness is never likely to be severe or prolonged at this yard, however, the high character of the firm for good work and quick production being always sufficient to secure them a share when any orders are in the market.

Messrs. S. P. Austin & Sons have just now a number of repair contracts in hand, one vessel being in the graving dock undergoing a heavy bottom repair, and another on the pontoon receiving an overhaul internally and externally. Another locally owned steamer is awaiting repair beside the yard and others are receiving attention at mooring stations in the river. The Sunderland Shipbuilding Company have a fair amount of work in hand, and are able to keep a large part of the machinery running.

Engineering.—At the Palmers Hill Works (Messrs. John Dickinson & Sons) a large steamer is lying at the quay to be fitted with new furnaces, manufactured by the firm. In the fitting and erecting shops a good proportion of the regular employés are being provided with work. No change in the state of business is to be noted at the other marine engine works, and the smaller works are still slack.

THAMES.

(*From our Own Correspondent.*)

Port of London Bill.—This measure, as finally passed, varies in only a few trifling details from what we have already stated. The Lords' amendments, giving representation to Kent and Essex on the new authority, were vetoed by the House of Commons and agreed to by both Houses, the reason put forward being that commercial and not geographical interests should have control and that those directly concerned should not be hampered in the direction in any way. The new chairman is appointed in the person of Sir Hudson Kearley, who at the Board of Trade piloted the bill through. This is a considerable achievement, as it will be remembered the Unionist Government failed to secure a victory for the same measure. The stumbling block was the question of price, and the present Government surmounted the difficulty by themselves fixing the price for the purchase of the docks and thus avoiding all delay. The amount is £23,702,686, to be paid for in new Port Stock. The tonnage dues on ships will be made uniform and a rate made on goods, to be fixed by the Board of Trade. There will be twenty-eight members on the new authority, of whom eighteen will be elected and seventeen of these will be chosen by payers of dues, owners of river craft and wharfingers, while the other will be the choice of those wharfingers who are in competition with the Port authority in their warehousing business. The river interests which were such opponents at the passage of the bill have come into line and have promised their aid to make the measure a working one. An association has been promised with this end in view, but it may be assumed already that the bill has been improved by the limitations that have been introduced. The dues upon goods and shipping will

not now exceed a certain sum in any one year, and this applies to goods dealt with in the docks and in the river. The matter has been thoroughly threshed out, and the opinion is expressed in some quarters that the Port of London is only about to commence under the new régime. The old Thames Conservancy automatically disappears under the new arrangement, and a body charged with the administration of the upper reaches of the Thames, as distinct from the Port, takes over its power in this direction. For this purpose are included all the towns on the banks of the up river, as far as Marlow. It will be seen, therefore, that everything is provided for, and it only remains now for the last die to be cast and the new authority to come into being.

County Council Steamboats.—In accordance with a resolution these boats to the number of thirty, and said to be lying in the Surrey Commercial Dock, are publicly advertised for sale, and tenders have to be in by the 9th inst, preference being given to purchasers who undertake to run a service on the river with the boats. It will therefore be interesting to see what the result of the sale will turn out to be under the peculiar circumstances of the case.

S.S. Malwa.—This new vessel of the P. & O. Co., of 11,500 tons, has arrived in the Thames from her builders on completion of official trials. She is 558 ft. in length and has two sets of quadruple-expansion engines, designed to develop 15,000 H.P. The speed attained was nearly 19 knots. The vessel has sundry improvements on the other ships of the M class, and was to leave Tilbury on her maiden voyage to Australia on the 29th January.

Yacht Racing.—A meeting of the Permanent Committee of the International Yacht Racing Union was held in London recently. The Union is divided into four groups, the British, German, Latin and Scandinavian, and at the meeting of the committee Mr. R. E. Froude represented Great Britain. The report of the Union for the first year of its existence was approved, and certain suggestions were forwarded to Lloyd's Register of Shipping in conjunction with the Germanischen Lloyd's and French Bureau Veritas Societies. As far as the Thames is concerned in this connection we have to record the closing of one of its clubs, the New Thames, and the sale of its club-house at Gravesend. The building, which stands so prominently on the river bank, has been under the hammer. It is the last of the clubs with head-quarters on the estuary to close its doors, the reason being the departing glories of the river for racing, owing to the quantity of shipping which interferes with the sport. The club was founded in 1867 as an off-shoot of the Royal Thames Yacht Club, which still has its head-quarters near Piccadilly. The sale by Messrs. Hampton of the club effects did not realize amounts that their quality appears to indicate they should have done.

NORTH-WEST OF ENGLAND.

(*From our Own Correspondent.*)

Prospects.—Taking things on a whole, the prospects are very good, although at the moment very little appears to be taking shape. Last month I stated that there was no longer any doubt as to where the Spanish work—or a good share of it—would go. Vickers', I said, would take an important share. This report has, during last month, gained considerable circulation both in London and provincial papers and also in "Vanity Fair." Reuter's cabled from Madrid that the Minister of Marine denied that any order had been placed with Vickers'. Despite all these denials I still state that Vickers' will receive a good slice of the work. It may be months before all the details are settled and the orders signed, but in the long run my forecast will be found to be correct. I have many reasons for believing so, and as these notes are being written important meetings of the directors, etc., are being held. The London offices have the matter in hand and are pushing forward with it. As to whether any ships will be built in this country I cannot say, neither can anybody else at the moment. That will be arranged later, but whether the shells are built in Spain or this country does not alter the fact that Vickers', together with some other firms, will have a lot of work to do and that there will be more than £7,000,000 spent. I am told that the work may extend over a period of seven years, at any rate enquiries are being made privately for suitable men who would be expected to be in Spain that length of time.

Apart from Spain and its work there is every prospect of a great amount of work coming to Barrow—and to other well-known British naval constructors. Chili has been nibbling for a long time now and there are rumours to the effect that before long they will have placed orders for vessels. It is not known whether they will want one cruiser of about 10,000 tons or a "Dreadnought" or two. If Brazil goes in for three and the Argentine for two, and perhaps three, then it seems a certainty that Chili will require more than one cruiser. These countries have the money, it is only a question of making up their minds to spend it.

There seem to be signs again of Japan and America getting at loggerheads now that the Roosevelt power (personal) is on the wane, and if that is so we shall see Japan in the market again. It has been expected that before this they would have given some more work to Vickers', and at one time there were reports to that effect, but up to now they seem content to build all their own.

The Barrow yard has received its fair share of warship orders, but one would like to see orders for some ocean-going vessels booked. It is known that the firm are not averse to this kind of work, and, what is more, their results as regards the obtaining of speed from both warships and channel fliers are pretty good. When the two big Cunarders were in the market Vickers' made a big bid for one and active preparations were made for the slips, etc., but the order did not come, and it has since been explained that it was due to the fact that the Buccleuch Dock passage way was not wide enough. This is now being widened to 100 ft., so that cannot stand in the way of any other likely order. Perhaps in time Barrow will have a chance to make its name as the building port of a record Western oceaner, and the sooner the better. In 1881 the yard turned out the *City of Rome*, and since then they have not ranked amongst the builders of Atlantic fliers. It is some time since any vessel has been turned out for one of the big foreign passenger companies. They have tendered, of course, many times for vessels and perhaps their turn will come. This class of work is welcome, inasmuch as it finds work for a greater variety of workmen than a battleship or cruiser.

The Old Dreadnought.—The *Dreadnought* which was built in 1879 is fast vanishing. This vessel is now lying at Vickers' new wharf, where the new 150-ton electric cantilever crane is engaged removing her heavy armour and big guns. She is the first vessel to lie at the new wharf, which should prove a great boon to Vickers'. All passageways to this new wharf are 100 ft. wide. A great amount of the metal is being shipped by coasting steamers to the Bristol Channel. As soon as this old bulwark is lightened sufficiently to permit of her being taken up to Preston, which is one of Ward's, of Sheffield, special breaking up places, she will leave Barrow.

The "Vanguard."—The *Vanguard* will be launched on Feb. 22nd at 11 a.m. from Vickers' yard. There are various reports as to who will perform the ceremony, and Mrs. McKenna's name has been mentioned, but the report lacks confirmation. This vessel has grown at a remarkable rate. Her keel was laid on April 1st, and when she is launched her weight will be upwards of 10,000 tons. Armour, machinery, etc., is constantly arriving and is being fixed rapidly. There seems to be little chance of this vessel being built and completed outside the limit of two years from the official date of the order. Nothing is being left to chance, and it is more than likely that should there be no accident or trade dispute Vickers' will have time in hand when she is complete.

The "San Paulo."—The Brazilian "Dreadnought" will be launched according to present arrangements on March 20th. Her launching weight will be about the same as the *Vanguard*. She is not wanted in such a hurry as the Britisher, but her engines are ready for putting in. There will be a fine sight when the two "Dreadnoughts" are launched, and they are lying side by side in the Buccleuch Dock. It will be the first time such a thing has been seen in Barrow, and it is doubtful if any private firm has launched two battleships within a month, of the total weight of over 38,000 tons.

A Disappointment.—It was a great disappointment to many in Barrow when the two orders for machinery for the "Dreadnought" and the cruiser missed Barrow. Of course, Barrow has little to grumble at, but many hoped that orders for one set would come. Brown's practically receive the two—one through Harland & Wolff. It may be Barrow's turn next.

The Dry Dock Problem.—Barrow may possess one of the finest shipyards in the world, but it is not complete. There is no accommodation as regards dry-docking for big vessels. There is a dry dock and also a floating dock, but neither is capable of dealing with the vessels which are built at that port. True, now Vickers' can use Beardmore's at Dalmuir, but that is not Barrow. What Barrow requires is a dry dock that will take anything built or likely to be built. It may be that Vickers' would find the initial cost too heavy to bear and that the local port authority, the Furness Railway, in these bad times does not feel disposed to share in the cost of a dock of such size. It is to be regretted. There is no doubt that sooner or later there will have to be one, and one Admiral has gone so far as to say that orders would not be placed with firms that had not connected with their yards adequate dry-dock accommodation. Trade has not been very good of late years, and it may be that Vickers' do not feel disposed at the moment to go in for a heavy expenditure. In a few years when briskness again marks the trade they may be inclined to go in for one. There is no difficulty about a site for a dock. There are several; in fact, Vickers' have lately in extending their yard become the owners of land adjoining the Walney channel which would suit admirably. A big dock might cost over a quarter of a million, and that is a large figure to spend, even for Vickers'. There is no reason why the Government should not subsidize the firms interested. In time of war a dry dock at Barrow would prove of inestimable value.

West Coast Hæmatite.—The West Coast hæmatite iron trade is very quiet, and but small parcels are in demand. The number of furnaces in blast has been further reduced. Prices have fallen further and now stand at 58/3 per ton net f.o.b. for mixed Bessemer numbers. The warrant iron market is dull, the last quotation being 57/4½ per ton net cash.

Shipping.—Shipping is very dull still, and freights are still very low. The exports of iron and steel this year do not compare favourably with those of last year for the same period, there being a decrease of 4300 tons.

SOUTHAMPTON.

(*From our Own Correspondent.*)

The Parsons Motor Co., Town Quay, have the following work in hand. A 60-H.P. motor and propeller set for a fishing vessel for service on the East Coast, also an order for a 7-H.P. and a 14-H.P. engine and propeller set for Australia. An order is to hand for a 7-H.P. engine and propeller set for a 26-ft. launch, also a similar engine has just been despatched to China, and a further order is expected for the same destination for two 28-H.P. engines. Enquiries for large and small engines continue good and there is every prospect of a busy season.

New Dry Dock at Woolston.—In December last a deputation from the Corporation and the Harbour Board waited on the Directors of the London and South-Western Railway Company, with a view of arranging for the construction of the new dry dock and works at Southampton, but the Directors of the Railway Company have decided to adhere to their original scheme of having the dock on the other side of the River Itchen—and they will shortly seek Parliamentary powers for its construction.

This intimation was contained in a letter from Sir Chas. J. Owens, General Manager of the Company, which was read at the Town Council's meeting on the 13th January. The letter also intimated that the Directors were willing to consider offers for the sale of land adjacent to the Town Quay. The letter was referred to the Parliamentary Committee of the Council.

This huge dry dock will be capable of accommodating the immense new steamers now building by Messrs. Harland and Wolff at Belfast for the White Star Line or any vessel contemplated in the near future. There has been considerable local feeling about the construction of the dock at Woolston, but the Southampton side is at present congested and was likely to be more so in the near future, and the construction of the new dock at Woolston, removes this state of affairs.

The Hamburg-American Line will inaugurate a new service from Southampton in March next, when the s.s. *Amerika* will sail from here on the express service on the 21st of that month for New York. She will be followed a week later by the *Cleveland*. The *President Grant* follows on the Boulogne-Southampton service, on April 5th, and the sailings will be continued by the ss. *Auguste Victoria*, ss. *Deutschland*, ss. *President Lincoln* and ss. *Blucher*, at an average rate of two sailings per week. In consequence of this arrangement there will not be any sailings from Plymouth for New York as previously, but on the return voyage some of the vessels will call there.

Messrs. Day, Summers & Co., Ltd., Northam Ironworks, have the following work in hand. S.Y. *Medusa*, 638 tons, owned by Mr. Alfred Farquhar, is fitting out for a cruise in the Mediterranean. In January last, the Duke of Sutherland's s.y. *Catania*, 668 tons, completed her outfit and sailed for the Mediterranean also. The *Sabrina*, 513 tons, Lord Winterstoke's yacht, was on the slip, and will shortly be fitted with a new foremast. The tug *Alert* and the p.s. *Hotspur* were put through the Board of Trade Survey. Good progress is being made with the new 226-ton steam yacht for Col. Gascoigne. Last month the Isle of Wight Co.'s p.s. *Prince of Wales* was on the slip undergoing repairs, and the same Company's *Princess Beatrice* and *Stirling Castle* were to follow. Since the beginning of the year, Messrs. Day, Summers & Co. have booked orders for three slipways.

The Local Manager of the Oceanic Steam Navigation Co., (White Star Line), has addressed a letter to the Harbour Board, informing them that with a view of bringing their Southampton-New York service up to the highest standard of efficiency and developing to the fullest extent the traffic *via* Southampton, they are having built at Messrs. Harland and Wolff's, Belfast, two liners of the highest class, much exceeding in tonnage any vessel now afloat or under construction, and urging the Board to commence dredging operations in order to provide ample depth of water so that these mammoth vessels may not be delayed on account of insufficiency of water. The letter states that the builders estimate the draught of the vessels leaving Southampton, will be 35 ft. and that the draught on arrival from New York will be approximately 32 ft. 6 in.; also that the vessels may be expected to take up their position in the service in the spring of the year 1912, and points out that the Board should take all the necessary steps, so that there will be no detention to the prompt sailings and landing of passengers, by providing ample depth of water at the port. The letter was referred to a sub-committee to report.

Messrs. J. I. Thornycroft & Co., Ltd., Woolston Works.—The following work is in hand at the above yard. H.M. T.B.D *Amazon*. This vessel was inspected by the Admiral Superintendent for contract-built ships and the representatives of the Chatham Division Home Fleet, and was handed over on January 20th last. H.M. first-class T.B. No. 31. This vessel has satisfactorily passed her principal trials and she will be handed over to the British Admiralty at the end of this month. H.M. first-class T.B. No. 32 has undergone her full-speed trials, and will shortly be completed and handed over. H.M. T.B.D. *Nubian*. The work on board this vessel is well in hand. The position with the work on the five steamers for Argentina is as follows: The ss. *Paso de Obligado* has arrived safely and in good order at Buenos Ayres, arriving there 1st January, and has been handed over to the owners. Ss. *Paso de Cuevas*. This vessel was launched just before Christmas and sailed for Argentina at the end of last month. Ss. *Paso de Martin Garcia* was launched on the 20th last month, and is now fitting out. Ss. *Paso de la Patria* is now on passage, having satisfactorily passed her official trials. Ss. *Paso de San Lorenzo*. This vessel is now well advanced, and will be put into the water at the end of this month. The work is steadily progressing on the tug boat and passenger flat for Chinese Rivers. H.M. Ocean-going T.B.D. *Savage*. This vessel's frames and angles are in hand preparatory to fitting in place after keel is laid. She is one of the new 27-knot turbine coal fuel destroyers. An order has been booked

for a steam yacht for Budapest. Speed and dimensions as follows: Speed 10 to 12 miles. Length, W.L. 60 ft.; breadth, 11 ft. 6 ins.; depth, 8 ft.; draught, 3 ft. All material is being prepared ready for erection on stocks. Steam yacht for Lord Leith. The dimensions of this yacht are as follows: Length, 202 ft.; breadth, moulded, 31 ft. 10½ in.; depth moulded, 17 ft. 8 in. The building of this yacht was placed in Messrs. Thornycroft's hands in the early part of January, and the preliminaries are well in hand. The engineering and shipyard departments have been well employed and sundry repairs have been done on troopships *Rohilla* and *Dongola*. Work has also been done on s.y. *Pandora*, a yacht recently acquired for exploration and survey purposes.

BELFAST.

(From our Own Correspondent.)

THERE is little new to report with regard to the shipbuilding trade on the Lagan. There have recently been rumours of orders of considerable importance having been placed in Belfast, but, so far, these reports lack confirmation. The Clyde ballot having resulted in an almost two-thirds majority in favour of agreeing to the proposed reduction in wages, the question may be asked as to how Belfast will be affected by this settlement. There was at one time a tacit understanding that Clyde rates should rule wages in Belfast; but the two big local firms being no longer associated with the Employers' Federation, this agreement has doubtless lapsed. Whether the local employers feel that the time has come for a justifiable claim for a reduction in wages remains to be seen: as yet no steps have been taken in this direction.

Messrs. Harland & Wolff have had a basin trial of the White Star liner *Laurentic's* machinery, and the fitting out of the vessel is being proceeded with with all rapidity, with a view to ascertaining as soon as possible the merits of the combination of turbine and reciprocating machinery in vessels of this class. The results of a thorough trial will be awaited with interest; but it may be said that the builders' belief in the economy and efficiency of the system is shared by other eminent authorities on the question of marine propulsion. The Red Star line have apparently no present use for the magnificent new addition to their fleet—the twin-screw steamer *Lapland*. This vessel has been practically completed for sea, and has for some time past been lying in the Musgrave Channel.

Messrs. Workman, Clark & Co.—This firm will shortly launch a large single-screw steamer from the South yard. Operations were recently resumed on the *San Paulo*, and the vessel is now ready for sea. This steamer is one of the five which Messrs. Workman, Clark & Co. had on hand in various stages of construction for the Lloyd Brazileiro Company at the time when it became known that the latter concern was in low water financially. Three of the vessels were then afloat, the fitting out of two of these having been almost completed.

The Harbour.—At the first meeting of the Harbour Commissioners in the New Year, the chairman called attention to the progress of the past year in regard to work carried out on the estate. At the beginning of 1908 the Alexandra Graving Dock was reopened after having been closed for nearly two years, in consequence of the two serious subsidences that took place. A double line of rails for electric cars was laid down the Queen's Road, and in addition to an efficient service being carried on through the day, large numbers of cars are run in the early morning and at night for the purpose of conveying the shipyard workers to and from the yards at reduced fares. Largely increased storage accommodation has been provided at the south end of the York Dock, and also on the Donegall Quay. The construction of the big new graving dock has also proceeded in a highly satisfactory manner, and it is expected to have this opened early next year. For some time past the matter of additional electric lighting on the Harbour property has been before the Board, and at the last meeting of Commissioners the joint report of the engineer and electric engineer, as to whether the necessary current should be taken from the City Corporation, or whether the Harbour power-house should be extended and additional plant put down, was considered. After considerable discussion it was decided to leave the question open until the statutory meeting to be held on 2nd February.

Londonderry.—At the last meeting of the Port and Harbour Commissioners, Mr. John M'Farland strongly urged his colleagues to face the question of constructing a large graving dock, with a view to resuscitating the shipbuilding industry in the port. The only existing dock can take in vessels of about 300 feet in length, but the shipyard, which has for the past few years been tenantless, is big enough for the construction of vessels of much greater dimensions, and indeed quite a number of steamers have been built in Derry, for which the existing dry-dock accommodation was useless.

Since the Londonderry Shipbuilding Co. went out of business there have been several "nibbles" at the yard, but none of these, unfortunately for Derry, ended in "catches." No doubt, in more than one instance, the fact that no business resulted was owing to the want of adequate docking accommodation. There is little or no reason why shipbuilding should not again flourish in this port, and a graving dock of suitable dimensions would certainly be a great inducement for a firm to start operations there.

CORRESPONDENCE.

We do not hold ourselves responsible for the opinions of our correspondents.

Condensing Plant.

To the Editor MARINE ENGINEER AND NAVAL ARCHITECT.

Sir,—With reference to the paper on condensing plant read by Mr. Bruce before the Institute of Marine Engineers, which you recently published, as there is a reference to the Leblanc system which is somewhat misleading, I trust you will give this letter the same publicity as you have already given to the paper.

In his paper Mr. Bruce said: "The Leblanc arrangement will not be gone into here, since we are more particularly concerned with purely marine appliances." From this it would appear that the Leblanc system is not suited for marine application. This is not the case, however, as several installations have already been fitted on board ship and others are now in course of construction. The first marine application of the Leblanc system was in the nature of an experiment, and was made by the French Admiralty on one of their torpedo boats. This torpedo boat is turbine-driven, and the original installation consisted of the usual surface condenser with reciprocating wet-air pumps. A Leblanc rotary valveless dry-air pump was also fitted to the condenser and comparative tests run under as near as possible the same conditions. At 14 knots the vacuum produced by the wet-air pumps was 708 m.m., and by the Leblanc pump 721·5 mm., an increase of ·53 in. At full load the corresponding results were respectively 696·5 m.m. vacuum and 724·5 mm. vacuum, or an increase in favour of the Leblanc system of 1·1 in. In addition to the increase in vacuum the Leblanc system had the further advantages that the space occupied was less, the weight only half of that of the reciprocating pumps, and the attention required when running much less. Owing also to the absence of all reciprocating parts and valves, the liability to breakdown was also very much less.

For P. J. MITCHELL.
J. A. McLAY.

London, 19th January, 1909.

We are pleased to note the return in restored health, of Professor A. C. Elliott, D.Sc., of the University College, Cardiff, from his voyage to Jamaica and back in the *Port Kingston*, which arrived at Bristol on January 12th. Kingston is beginning to resume its former position as a centre of population, the houses and shops are being gradually rebuilt on improved lines and the public buildings reconstructed or renovated as found necessary after the devastation made by the earthquake and subsequent fires of two years ago.

LAUNCHES AND TRIAL TRIPS.

LAUNCHES—English.

Paso de Cuevas.—On December 23rd, a steel steamer, named *Paso de Cuevas*, was launched at Woolston, Southampton. Owners, Marina Mercante Argentina Company. Port of registry, Buenos Ayres.

Minhla.—On January 6th, a steel screw petroleum steamer was launched on the Tyne, built to the order of the Burmah Oil Co., Ltd., of Glasgow. The principal dimensions are:—Length, 208 ft.; breadth, 34 ft., and depth, 18 ft. 6 in. The scantlings and arrangements of the vessel are in accordance with the Board of Trade requirements, and those of Lloyd's Register for 100 A1 classification. After the launch the vessel was taken to the works of the Wallsend Slipway and Engineering Co., Ltd., where she will be fitted with triple-expansion machinery. The cylinders will be 17 in., 28 in. and 46 in. in diameter, with a stroke of 30 in., steam being supplied by two boilers 10 ft. 6 in. diameter by 11 ft. 3 in. long. The boilers will be in accordance with the latest practice for burning either liquid fuel or coal. The vessel was named *Minhla*.

Danubian.—On January 21st, Messrs. Swan, Hunter and Wigham Richardson, Ltd., launched the above vessel, built to the order of Messrs. Lane & Macandrew, 26, Great St. Helens, London, for the carriage of petroleum in bulk. The *Danubian*, which has been supervised during construction by Messrs. Flannery, Baggallay & Johnson, of London, Liverpool and Rotterdam, is of the following dimensions:—399 ft. 6 in. overall by 51 ft. 6 in. by 30 ft. 3 in., and is to carry 7100 tons of petroleum, is being built to the highest class at Lloyd's, and also to fulfil the Suez Canal regulations for petroleum ships. The machinery is of the triple-expansion type by the Wallsend Slipway and Engineering Co., Ltd., and has cylinders 27 in. by 45 in. by 74 in. by 48 in. stroke, taking steam from three large single-ended boilers at a working pressure of 180 lbs. A very complete installation of cargo pumping gear has been fitted, and the vessel is supplied with steam heating and electric light throughout. The vessel was gracefully named *Danubian* by Mrs. Frank Morris as she left the ways.

Simcoe.—On January 21st, a small, but interesting, twin-screw steamer, constructed at the Neptune Works of Messrs. Swan, Hunter & Wigham Richardson, Ltd., was launched. This vessel has been built to the order of the Canadian Government, and is destined for use as a lighthouse tender and for buoy service in Georgian Bay For these purposes the steamer is equipped with appliances for lifting exceptionally heavy weights, including powerful winches and derricks. The vessel is also adapted for safe navigation amongst the ice, which she will frequently meet when on service. The steamer is being fitted by the builders with twin-screw triple-expansion engines, which receive steam from two water-tube Babcock & Wilcox boilers. The vessel is 180 ft. in length, by 35 ft. beam, built of steel with poop and forecastle, the well between being adapted for the carriage of the larger buoys. The vessel is to be fitted with an installation for wireless telegraphy and has a Stone's underwater ash expeller. The accommodation, which has been specially designed for comfort in both hot and cold weather, will accommodate, not only the officials directly connected with the ship, but also the Canadian Government officials whose duty it may be to inspect the lighthouses, etc. In addition to the ordinary equipment of boats, lifeboats, etc., a powerful steam launch is to be supplied. The Canadian Government were represented at the launch by Mr. Duguid and Mr. T. R. Ferguson, and the christening ceremony was gracefully performed by Mrs. G. F. Tweedy, of The Nook, Jesmond Park, Newcastle, wife of Mr. G. F. Tweedy, a director of Messrs. Swan, Hunter & Wigham Richardson, Ltd.

Fretza Mendi.—On January 22nd, Messrs. William Gray and Co., Ltd., launched the handsome steel screw steamer *Fretza Mendi*, which they have built for Messrs. Sota and Aznar, of Bilbao. She will take the highest class in Lloyd's Register and is of the following dimensions, *viz.*, Length overall, 377 ft.; breadth, 50 ft. 3 in.; and depth, 27 ft. 10 in., with bridge, poop and topgallant forecastle. The saloon, state-rooms, captain's, officers' and engineers' rooms, etc., will be fitted up in houses on the bridge deck, and the crew's berths in the forecastle, while in the poop accommodation will be provided for a large number of cadets and Professor of Navigation. The hull is built with deep frames, cellular double bottom and large aft-peak ballast tank, six steam winches, steam-steering gear amidships, hand-screw gear aft, patent direct steam windlass, large horizontal multitubular donkey boiler, shifting boards throughout, stockless anchors, telescopic masts with fore and aft rig, and all requirements for a first-class cargo steamer. Triple-expansion engines are being supplied by the Central Marine Engine Works of the builders, having cylinders 27 in., 43 in. and 72 in. dia., with a piston stroke of 45 in., and two large steel boilers for a working pressure of 180 lbs. per square in. The ship and machinery have been constructed under the superintendence of Mr. Goieoechea and Mr. Undabarrena on behalf of the owners, and the ceremony of naming the steamer *Fretza Mendi* was gracefully performed by Mrs. Archd. Rickinson, of West Hartlepool.

Notre Dame des Dunes.—On January 25th, there was launched from the ship yard of Messrs. Cochrane & Sons, shipbuilders, Selby, a handsomely modelled steel screw trawler, the principal dimensions being 160 ft. by 25 ft. by 14 ft. 6 in. moulded. The vessel has been built to the order of French owners, and will be fitted with powerful triple-expansion engines by Messrs. Amos & Smith, of Hull, and is replete with all the latest improvements for fishing purposes. As the vessel left the ways she was gracefully christened *Notre Dame des Dunes* by Miss Cochrane, of Hull, after which the company adjourned to the builder's offices, where the customary toasts were given and responded to. The company included Captain Bourgain (representing the owners), and Mrs. Bourgain, Mr. Boyd, French Consul at Hull, and Miss Boyd, Mr. H. F. Fourny, Bureau Veritas surveyor at Hull, under whose inspection the vessel has been built, Canon Gordon, and Dr. Scannell, of Selby, Mr. Spink, of Hull, etc., etc.

LAUNCHES—Scotch.

Beothic.—On December 25th, Messrs. David & William Henderson & Co., Ltd., launched from their shipbuilding yard at Partick, the handsomely modelled steel screw steamer *Beothic*, which they have built to the order of Messrs. Job Brothers, of Liverpool, and St. John's, Newfoundland. This vessel is intended for the seal fishing industry, and is therefore of exceptional strength for forcing her way through the ice, and is also replete with everything that can add to the economical working of cargo. The principal dimensions of the vessel are:—Length between perpendiculars, 240 ft.; breadth moulded, 35 ft. 6 in.; depth moulded, 19 ft., with a gross tonnage of about 1200 tons; is classed 100A1 in Lloyd's Registry, and has accommodation in houses on bridge deck for a limited number of passengers. The machinery, which has also been constructed by Messrs. Henderson, consists of triple-expansion engines, having cylinders 22 in., 36 in. and 59 in. diameter by 39 in. stroke, two single-ended boilers, having a working pressure of 180 lbs. The vessel has been constructed under the supervision of Messrs. George Hepburn & Sons, Liverpool, in conjunction with the owners' superintendent, Mr. W. S. Crossman.

Seagull.—On January 22nd, Messrs. Wm. Simon & Co., Ltd., launched from their yard at Renfrew, the second of three special service steamers which they are constructing to the order of the Rangoon Port Commissioners. The vessel, as she left the launching ways, was gracefully named the *Seagull* by Miss Janie Brown, daughter of Mr. Wm. Brown, M. Inst. C.E., chairman of the company. The *Seagull* and her sister ships are each of 1000 tons deadweight carrying capacity, and are specially arranged for carrying stones and rubble across the Gulf of Martaban to Rangoon, in connection with the formation of retaining walls, etc., at the latter port. The vessel is propelled by one set of triple-expansion surface-condensing engines and large multitubular high-pressure steel boilers, designed for burning inferior coal, and easily capable of supplying engines with steam for a speed of 10 knots. All the most modern auxiliaries are provided in the engine-room, including steam and hydraulic reversing gear, independent pumps, feed heater, etc. A steam windlass is fitted forward and a steam capstan aft for mooring purposes. The hold for carrying the stones

is divided into compartments and the discharge doors are controlled by steam appliances designed so that each compartment may be emptied independently of the others, or that all the compartments may be discharged at the same time. Spacious and well-ventilated cabins in teak wood are placed on deck for the accommodation of the officers, and of the official controlling the operations. The construction of the vessel, which is classed at Lloyd's, has been carried out under the direction of Messrs. P. W. & C. S. Meik, M.I.C.E., London, assisted by Mr. Robert Anderson, resident inspector.

Hollandia.—On January 23rd, Messrs. Alex. Stephen and Sons, Ltd., Linthouse, launched the large twin-screw steamer *Hollandia*, built to the order of the Koninklijke Hollandsche Lloyd, of Amsterdam, for their passenger and cargo trade between Holland and South America. The dimensions of the vessel are :—Length, 420 ft. ; breadth, 54 ft. ; depth, 38 ft. While principally designed for passengers, she will carry a large cargo, in addition to the great quantity of coal and stores required for the voyage from Amsterdam to Buenos Ayres ; and her cargo gear has been arranged for the speedy and economical handling of cargo of any weight up to 50 tons in one lift by means of sets of three powerful winches at each hatch. A large space has been divided off and insulated for the reception of frozen goods, the refrigerating apparatus being on the CO_2 system by Messrs. Hall. The bulkheads dividing the cargo holds are carefully arranged to make the best possible sub-division, and in addition the Stone-Lloyd system of automatically closing the water-tight doors has been fitted throughout, so as to make the vessel practically unsinkable. The passenger accommodation is very extensive, occupying four decks and embracing first, intermediate and third classes. In the first class the numerous state-rooms are particularly roomy, a large number being arranged as single-berth cabins, the remainder being fitted for two persons only. This system of making the state-rooms practically private throughout the ship has enabled the owners to dispense with the old-fashioned overhead berths, thus affording passengers a luxurious provision of wash-basins, wardrobes, seats, tables and sofas. There are also fitted electric bells communicating direct with the steward ; steam heating for cold weather and electric fans for hot, and extra large windows to the rooms, with jalousies for use in the tropics. Very complete lavatories with bath and sprays, etc., fitted with hot and cold water, are arranged convenient to the state-rooms. The corridors alongside the state-rooms have been laid with indiarubber tiles ; and every care has been taken to make each room a comfortable living room. The public rooms, dining saloon, social hall and entrance, and smoking-room are all large rooms, lavishly decorated by a firm of designers and decorators in Holland, and comprise all the best modern features. All the rooms are brilliantly lighted during the day by large windows and domes of stained glass, and at night by electric lamps. In addition, the first-class passengers have a large promenade deck completely sheltered by a boat deck overhead, with various sheltered spaces for use in hot climates. The intermediate passenger accommodation is situated aft in the poop, and includes excellent state-rooms (many arranged as two-berth rooms) with a large dining-room and social hall opening on to a covered deck, with a large promenade space above. The third-class passengers are berthed in the 'tween decks, with dining spaces, etc., and numerous baths and lavatories in deckhouses on the weather deck. In the working part of the vessel are numerous other fittings designed for the comfort of the passengers, such as a complete laundry, comprising washing, drying and ironing machines of all kinds for every type of laundry work ; galleys for the various classes—each containing separate ranges, ovens, steam stock pots, steamers, etc. ; a bakery and baker's shop, with electrical dough mixers and special ovens for baking the daily supplies of bread, as well as other bakers' confections ; sculleries with electrical potato peelers, refrigerated ice cream makers, water coolers, electrical dish-washers, etc., etc., as well as pantries and bars, with all the latest appliances for keeping hot or cold their respective specialities. In addition may be mentioned a photographic dark-room, a Marconi installation, a printing-room, a specially appointed hairdressing saloon, thoroughly equipped hospitals, etc. The engines, which have also been constructed by Messrs. Stephen, are twin-screw triple-expansion type, with cylinders (each a separate casting with liner), the diameters being 23½ in., 39½ in. and 66 in. respectively by 48 in. stroke. The boilers are fitted with Howden's forced draught, and the boiler power is very ample. The equipment embraces all the up-to-date auxiliaries—including Stone's ash expeller, See's ejectors, Baker's blower for drying double bottom with heated air, two dynamos, each sufficient for the whole electric installation, the Stellite automatic electric whistle operator, etc. The steamer was named *Hollandia* by Miss Stephen, 8, Prince's Terrace, Glasgow. Among those present, besides the Messrs. Stephen, were Mr. J. Wilmink, managing director of the owner's company ; Mr. J. de Bruyn Kops, Amsterdam, the company's naval architect ; Mr. Foudraine, the company's superintendent engineer, and others.

LAUNCH—Irish.

Abangarez.—On January 23rd, Messrs. Workman, Clark and Co., Ltd., of Belfast, launched from their South Yard a large handsomely modelled steel screw steamer built by them for the Tropical Fruit Steamship Co., Ltd., Glasgow (Messrs. Clark & Service, managers). As the vessel left the building slip she was gracefully named *Abangarez* by Mrs. Porter, wife of Captain Porter, resident ship superintendent for the owners. The *Abangarez* is intended for the banana, general and refrigerated freight trades between the West Indian and United States ports, is the ninth steamer built by this firm for these owners, and it is of interest to note that she is the seventeenth steamer specially designed and built by Messrs. Workman, Clark & Co., Ltd., for the fruit carrying service, and when finished will be the finest and most efficiently equipped vessel engaged in this trade. The *Abangarez* is 394 ft. in length, with a gross tonnage of 5000 tons, and has been built under special survey for the highest class R.B.S. in the British Corporation Registry of Shipping, the requirements demanded by the British Board of Trade and the United States Steamship Passenger Inspection Service for a first-class passenger and cargo steamer having also been fully complied with. In designing the vessel the builders have been greatly assisted by the advice of Captain Wm. Anderson, who has had a life-long experience in the West Indian fruit trade, and special consideration has been given to the requirements of passengers in the tropics, with a view to securing perfect comfort for those travelling by these steamers. Accommodation is provided in large and well-lighted state-rooms for over one hundred first-class passengers, these rooms being arranged amidships on the upper bridge and promenade decks, with the dining saloon extending the full width of the vessel, on the upper deck, a large entrance hall and lounge and the smoking-room on the bridge deck ; also a luxurious music-room and special cabins *de luxe* on the promenade deck. The dining saloon is particularly well lighted, having large windows in the sides and a lighting well surmounted by an artistically decorated dome over the centre. With a knowledge of the variation of climate in which the vessel will trade special attention has been given to the installation throughout the vessel of a complete system of steam heating for use in cold weather, while the other extreme has been provided for by the fitting of an efficient arrangement of ducts by means of which cooled fresh air can be delivered to all the public and private rooms, small electrically driven fans being fitted in each room for producing a perfect circulation of the air. Roomy and well-sheltered spaces for deck games and promenading are provided on the bridge and promenade deck, while an alcove placed aft of the smoking-room and well furnished with garden seats and small tables affords a comfortable lounge in the open air. The purser's office and enquiry bureau in the main alleyway will prove to be a great convenience to passengers, while the wireless telegraph room, fitted up with the necessary instruments for receiving and despatching messages by wireless telegraph and telephone, will enable passengers to keep in touch with the news of the world. The sanitary and lavatory arrangements are replete with the most modern fixtures, while an exceptionally large quantity of fresh water is stored for use during the voyage, that intended for drinking purposes being passed through a filter tank, while a drinking fountain supplied with iced water is placed in main entrance hall. The eight compartments into which the cargo space is divided have been carefully insulated and prepared for the carriage of fruit and

meat as food. For the purpose of keeping these cargoes in fresh and marketable condition, cooled fresh air is delivered by electrically driven fans through ducts to each compartment. The holds are furnished with four large hatchways, each of which is provided with steam winches and the necessary derricks and special appliances for effectively dealing with the general cargo and fruit in bulk, while a special derrick is fitted for lifting heavy weights, such as motors and other consignments. The propelling machinery consists of a set of triple-expansion engines developing 3800 I.H.P., and capable of driving the vessel at a speed of 14¾ knots. The vessel has been built under the supervision of Captain Porter, while Mr. Llewellyn Williams has superintended the construction of the machinery and the details of refrigeration and insulation.

TRIAL TRIPS.

Cheyenne.—On December 22nd, the steamer *Cheyenne*, a steel three-deck tank steamer, built by Messrs. Swan, Hunter & Wigham Richardson, Ltd., Wallsend-on-Tyne, to the order of Messrs. H. E. Moss & Co., of Liverpool, London and Newcastle, and sold by them to the Anglo-American Oil Co., London, was taken out to sea for her trial trip. The vessel is of the following dimensions: 400 ft. overall, 50 ft. 6 in. breadth extreme, 30 ft. 11 in. depth moulded. She will carry about 6500 tons of oil in bulk in a number of separate oil-tight compartments, as well as about 550 tons of bunkers. The engines, which have been built by the Wallsend Slipway and Engineering Co., Ltd., consist of a set of triple-expansion engines, having cylinders 26 in., 43 in. and 72 in. in diameter by 48 in. stroke, with four single-ended boilers working at a pressure of 180 lb. per square inch. The vessel will take the highest class at Lloyd's and Bureau Veritas. On the trial trip she attained a speed of about 11¾ knots. There were present Mr. Archibald Maclean and Mr. G. Hume, of the Anglo-American Oil Co.; Mr. E. A. Cohan and Mr. W. M. Cohan, of Messrs. H. E. Moss & Co.; Mr. C. S. Swan, Mr. G. P. Denton and Mr. W. M. Webster, of Messrs. Swan, Hunter & Wigham Richardson, Ltd.; and Mr. Gilbert Campbell, of the Wallsend Slipway and Engineering Co., Ltd.

Cataluna.—On December 24th, the steamer *Cataluna*, built on the Wear and engined by the North-Eastern Marine Engineering Co., Ltd., has had a successful trial trip, the guaranteed speed being exceeded. The owners' representative expressed himself highly satisfied with both vessel and machinery.

Harford.—On December 28th, the new screw steamer *Harford*, built by Messrs. John Readhead & Sons, West Docks, South Shields, to the order of Messrs. J. & C. Harrison, Ltd., London, was taken to sea for her official trial trip. The vessel is of the following dimensions, *viz.*:—Length, 387 ft. overall by 51 ft. 6 in. extreme breadth, by 28 ft. 3 in. depth moulded. She has been built to Lloyd's highest class under their special survey, and is of the improved single-deck type, with complete lofty shelter deck fitted with sidelights all fore and aft, and has large holds quite clear of all beams and side pillars. A steel centre line bulkhead is fitted all fore and aft in holds for grain division. There are deck houses for captain and passengers, and also house on top of same for captain's accommodation and chart house. The accommodation for engineers and officers is in steel houses alongside of engine casing, and the crew are berthed in after part of shelter deck. Deck houses are also fitted aft for steering house and crew's accommodation. She is also fitted with double bottom all fore and aft for water ballast, also with extra large after-peak tank for the same purpose. The arrangements for loading and discharging are of a complete and up-to-date character, the vessel being fitted with eight large steam winches supplied with steam from a donkey boiler of multitubular type; also ten derricks, which are worked from outriggers and tables on the masts, also one portable steel derrick for lifting weights up to 10 tons. The vessel is fitted with triple-expansion engines, also constructed by Messrs. John Readhead & Sons, having cylinders 26½ in., 43 in. and 71 in. by 48 in. stroke, supplied with steam from three large steel boilers working at a pressure of 180 lbs. per square inch. After the trial, which was in every way satisfactory to all concerned, the vessel proceeded to Tyne Dock to bunker. The steamer has been superintended during construction by Messrs. E. J. Caiger & Co., of London, on behalf of the owners.

Harfleur.—On January 4th, the handsome steel screw steamer *Harfleur*, built by Messrs. W. Gray & Co., Ltd., West Hartlepool, for Messrs. J. & C. Harrison, Ltd., London, had her trial trip. The vessel has been built to Lloyd's highest class, and is of the following dimensions, *viz.*:—Length overall, 396 ft. 6 in.; breadth, 51 ft.; and depth, 29 ft., with two decks laid, long bridge, poop and topgallant forecastle. The saloon, with teak panelling, state-rooms, captain's, officers', and engineers' rooms, etc., are fitted up in houses on the bridge deck, and the crew's berths in the forecastle. The hull is built with deep frames, clear holds, cellular double bottom and large aft and fore-peak ballast tanks, nine steam winches, return exhaust and winch condenser, steam-steering gear amidships, hand-screw gear aft, patent direct steam windlass, large horizontal multitubular donkey boiler, steel shifting boards, stockless anchors, telescopic masts, with fore and aft rig, boats on deck overhead. Electric light is fitted throughout, and all the requirements for a first-class cargo steamer. Triple-expansion engines are supplied by the Central Marine Engine Works of the builders, having cylinders 26 in., 42 in., and 70 in., with a piston stroke of 48 in., and two large steel boilers for a working pressure of 180 lbs. per square inch. The hull and machinery have been built under the superintendence of Messrs. E. J. Caiger and Co., consulting engineers, London. Mr. W. Crandell, of the firm of Messrs. Caiger & Co., witnessed the trial; the shipbuilders were represented by Captain J. E. Murrell, the engine builders by Mr. W. Reynard, and Captain Sadler was in command. During the trial the machinery ran smoothly and well and the behaviour of the ship was highly satisfactory, an average speed of 12 knots being obtained. On the conclusion of the trial the vessel proceeded to Barry to load.

Werribee.—On January 16th, the fine steel screw cargo steamer *Werribee*, built by the Blyth Shipbuilding and Dry Docks Co., Ltd., to the order of Messrs. Huddart, Parker and Co. Proprietary, Ltd., of Melbourne, was taken to sea for trial. This vessel, which measures 368 ft. in length, with a beam of 50 ft., is of the single-deck type, having poop, bridge and topgallant forecastle. The *Werribee* has been specially designed for the Australian coal trade, and is classed 100 A1 at Lloyd's under special survey. A special feature on the *Werribee* is the equipment of deck machinery, comprising ten steam winches ("Liverpool" type) and friction winches by Messrs. John Lynn & Co., Ltd., powerful steam windlass by Messrs. Clarke, Chapman & Co., Ltd., and steam-steering gear by Messrs. Donkin & Co. Messrs. Clarke, Chapman & Co., Ltd., have also supplied and fitted a complete electric light installation throughout the ship. Triple-expansion engines—cylinders 24 in., 39 in. and 66 in. by 45 in. stroke, having steam supplied from three large boilers—have been supplied and fitted by Messrs. Richardsons, Westgarth & Co., Ltd., at their Hartlepool Engine Works. The representatives of owners, builders and engineers on board the *Werribee* were highly satisfied with the performance of both ship and machinery on being run over the measured mile, good results being obtained. The *Werribee*, under the command of Captain Bates, then proceeded to Middlesbrough to load general cargo for Australia.

United States Metallic Packing Co., Ltd.—This company has opened offices at 52, St. Enoch Square, Glasgow, in order to cope more satisfactorily with its business in Glasgow and the West of Scotland.

On Friday, January 22nd, an interesting presentation took place at the Board of Trade offices, 54, Victoria Street, S.W., when Mr. Peter Samson, I.S.D., who is retiring from the position of Engineer Surveyor-in-Chief to the Board of Trade, which position he has held for the last thirteen years, was presented by his colleagues at the Consultative Department with a handsome silver bowl, suitably inscribed, as a token of their personal respect and esteem. The hope was expressed that he might be spared for many years in health and strength to enjoy the peace and ease of retirement which he had so well earned by thirty-six years of strenuous work in the Board's service. Mr. Samson's retirement took place on the 24th instant, and he is succeeded by Mr. A. Boyle, the present Chief Examiner of Engineers to the Board of Trade.

The Marine Engineer

And Naval Architect.

LONDON, MARCH 1, 1909.

SIGNALLING AT SEA.

ALTHOUGH we have had many instances in the past of the utility of wireless telegraphy, there has been no more striking instance than that of the collision between the *Florida* and the *Republic*, and we would gladly add our testimony of appreciation of the high courage, tenacity of purpose and earnest effort displayed by the various individuals associated with the apparatus in this particular case.

The reports which have come to hand from various sources constitute really romantic reading, telling, as they do, of how suddenly the distant shore and the number of ships widely distributed over the Western Atlantic received the sea messages through the ether indicating disaster. These messages were picked up by the siasconet station, the French liner *Lorraine*, the *Lucania*, the *Furnessia*, the *Baltic* and other steamers. These vessels, on receipt of the message, seek directions, and, unseen by one another, focus their efforts to give relief to the distressed.

We need not here refer in detail to the successful result of their efforts, but feel it our duty to accord our highest appreciation of the services rendered, and our recognition of the great triumph of utility achieved by wireless telegraphy. At the same time we think that a word of praise should be given to the submarine signalling appliances, which appear to have been particularly useful as a means of communication from ship to ship when they were unseen by each other. It is interesting to note that, in spite of the success attending the use of the apparatus at present employed, Mr. Marconi is busily engaged in developing an important improvement in this system, whereby it will be possible to send and receive messages simultaneously at the same station, and it is believed that when the improvement is introduced, which we understand will be in the course of a month or two, a service will be available with each apparatus at least equal to one duplexed cable; thus the capacity of the station will be probably more than doubled. The general adoption of wireless telegraphy by ships, particularly those running on recognised routes, should tend to reduce the premium of insurance paid to the underwriters, as the facility of communication should materially reduce the risk of disaster.

In a science, such as wireless telegraphy, having such great potentiality in the direction of service to mankind, it is satisfactory to note that the relations existing between the postal authorities and commercial corporations are on a satisfactory basis, so that a maximum of benefit will accrue with a minimum of expenditure.

HEAT TRANSMISSION IN BOILERS.

THIS subject has been treated by Dr. Nicholson, the Professor of Mechanical Engineering in the University of Manchester, in a paper read in January before the members of the Junior Institution of Engineers, which has become a subject of discussion in our contemporary, *The Engineer*, who considers the experiment carried out by Dr. Nicholson to have been irregularly conducted, while other writers have put forward expressions of opinion in favour of it. The paper which we have before us is well put, but is of such a kind as would serve to make all engineers feel small as regards their design and manufacture of boilers. Dr. Nicholson quotes a preliminary paper by Professor Osborne Reynolds on the extent and action of the heating surface of steam boilers, and in such quotation he remarks that Professor Reynolds merely read such a paper with the intention of it being followed up by experiment and further investigation. This does not seem to have taken place till nearly a quarter of a century had elapsed, when Professor John Perry, in his book on the "Steam Engine," seems to have concluded that when a good scrubbing action is established on both sides of the metal plate there ought to be at least ten times, and may be more than a hundred times, as rapid evaporation per square foot of heating surface as has yet been obtained in any boiler. Now this is what we want, and if we could be assured of any principle on which to work it would soon be accomplished. Dr. Nicholson has, since this time, taken up the subject by experiment, and gives a dictum that where there is a difference of temperature between either side of a plate, the quantity of heat passing through a metal plate is proportional to the difference of the temperatures and inversely as the thickness of the plate multiplied by a constant which represents the thermal conductivity, such being the number of thermal units passing per hour across a plate one inch in thickness when its sides are kept at a constant difference of 1° F. He concludes by this formula that the present actual difference of the temperatures could only be about 7° or 8° F. to produce an evaporation of only about 5lbs. or 6lbs of steam from and at 212° F. Now, upon this principle, he endeavours to show by experiment, that as the surfaces of plates are really full of holes and pock-marks, that is, are rugged and porous relatively to the size of molecules of gas, the said ruggedness is full of particles of gas which have given off their heat to the plate, and have thus lost their translational velocity, so that they interfere with other particles of heated gas behind them. Thus it is believed that there is, in a current of hot gas passing under the face of a heating plate, a

series of successive rates of velocity ending at the plate with what is almost no translational velocity at all, the gases that have parted with their heat forming this exterior zone of no velocity. He therefore advocates the driving of the heated gases past the heating plates of a boiler by at least six times the usual speed, which will probably cause the gases to become involved, and that the hot gases will thereby cause the layer of particles nearest the heating plate which have discharged their heat to be violently moved away from the plate, and thus allowing other hot gas particles to themselves strike against the heating plate. He holds, therefore, that the rate of heat transference from a gas to a plate is directly proportional to the speed of flow of the gas. He states that he has secured an evaporation of 41 lbs. per square foot per hour through the flue plate of a Cornish boiler by the simple expedient, just described, of increasing the speed of flow of the gas in the flue to a degree which, although far beyond anything yet tried in steam boilers, is well below the extreme of what seems possible. This result was attained behind the fire bridge, in such a position that it is unlikely that there was any actual flame present at all. This he claims would make a considerable saving in boiler weight per horse power developed, of boiler volume, and of floor space per square foot of grate required. He considers this might make a difference of saving of one-third to one-half of boilers in the stokeholds of destroyers and ocean liners, even if forced draught of 10 or 20 inches of water gauge, induced by fans, were used. Our contemporary, *The Engineer*, has stated that the conclusions to which Dr. Nicholson has come cannot be realized, though Dr. Nicholson has stated that the result of 41 lbs. of water per square foot per hour has been experimentally produced by him. It is stated that it is not the cold film which adheres to the plate that causes the pushing away of the succeeding films of highly heated gases, but that, owing to the conductivity of the plate being so great, it cannot attain a temperature much above that of the water on the other side. To obtain such a difference between the heat skin and the water skin of the plate as 1000°F. the fire side of the plate would have to be red hot. But this it cannot be. The fiercest heat of a smith's forge has failed to give a gradient of more than 86°F. The mistake usually made lies in assuming that the plate next the fire must be almost as hot as the fire. To this reply, however, Dr. Nicholson in a recent letter argues that, taking the total heat from the experimental Cornish boiler, which is applied as evaporating heat including the economiser added to the boiler, he finds that the whole evaporation was at the rate of 13·5 lbs. of water per hour per lb. of coal from and at 212°F., and this corresponds to 13·030 B.Th.U., and is the quantity of heat given to the water per lb. of coal. Allowing further for the chimney loss of heat with 15lb. of air supplied per lb. of coal, which would make up about further 440 B.Th.U., this would in total make up 13·470 B. Th. U. taken up in evaporation and waste up the chimney, which he considers is practically all that could be expected from the coal burnt, which was small and dusty, costing only 8s. 6d. per ton. We think that Dr. Nicholson has given a very good paper upon this subject, and it only requires to make the essays experimentally with boilers adapted in their heating surfaces to cause the hot gases to travel at some six to ten times the ordinary rate of travel to obtain such results as would serve to make this theory effective or otherwise.

A REVERSIBLE ROTARY ENGINE.

A NEW form of rotary engine has been invented by Mr. Staal, an engineer of Antwerp, which is not only adapted for reversing, but also allows of the expansion of the steam. The design of the engine, which we have seen in the drawings, is compact in form, and the internal parts are reduced to a minimum. In order to avoid wear and tear a special valve has been arranged to regulate the pressure and vacuum alternative. We understand that the inventor claims that an economy of 15% is obtainable over a reciprocating engine of the same power.

At the examination for extra first-class engineers held in January, the following were successful:—At North Shields, Mr. G. Robson, of South Shields; at Cardiff, Mr. W. H. Colpitts, of Barry; at Glasgow, Mr. A. N. Thompson, of Glasgow, and Mr. T. Miller, of Burn of Cambris, N.B.; at Bristol, Mr. A. Stone, of Bristol. Three of the above received their coaching entirely by Messrs. Thorn's system of postal tuition, the great success of which is seen in the fact that out of the last ninety-six extra chiefs who have passed from the above school, fifty were coached by the postal method All the candidates herein were prepared by Messrs. W. H. Thorn & Son, 5, Waterville Terrace, North Shields, whose record now stands at 182 extra chiefs, 30 surveyors, and over 6900 chiefs and seconds.

A CHANCE FOR ENGLISH SHIPBUILDERS.—SIR PERCY SCOTT'S SOUTH AMERICAN CRUISE.—Little attention has as yet been called to a fact which must be of the utmost importance to shipbuilders and others in this country, and which should not be lost sight of by those with whom trade is slack.

An important effect of the recent voyage of Sir Percy Scott's second cruiser squadron has not been generally noticed. This is that each South American Republic visited has announced its intention of increasing its naval strength after the manner of Brazil by the construction of more modern ships.

Argentina, for instance, now proposes to build three cruisers of the *Invincible* class, nine ocean-going and sixteen coastal destroyers, while Uruguay, though she has not yet actually formulated any programme, has just appointed a naval attaché in the person of Lieutenant Edoardo Soaz, who has since obtained permission to visit the public dockyards under the usual conditions.

Coming at such a time it may reasonably be expected that the visit of the splendid armoured cruisers under Sir Percy Scott will result in the orders for the vessels being placed in England, and should this be so, which is very likely, it will mean increased employment, not only in the districts in which the ships are actually constructed, but also in the iron and steel centres which supply the guns and armour for them.

There should thus be a welcome return of prosperity to the shipbuilding industry, which very badly needs it at the present time.

THE "NIKI" SCREW PROPELLER.

TO paraphrase the words of the Royal poet: "Of the making of propellers there is no end." There are propellers with two, three, four and more blades; with simple and with increment pitch; with even such as may be reversed so as to drive the vessel backwards without reversing the motion of the shaft. (These last would be a wonderful thing for turbine vessels if they were practical, which, up to date, they are not.)

One of the latest screws, and one which has shown itself to be very successful in actual hard work, is the

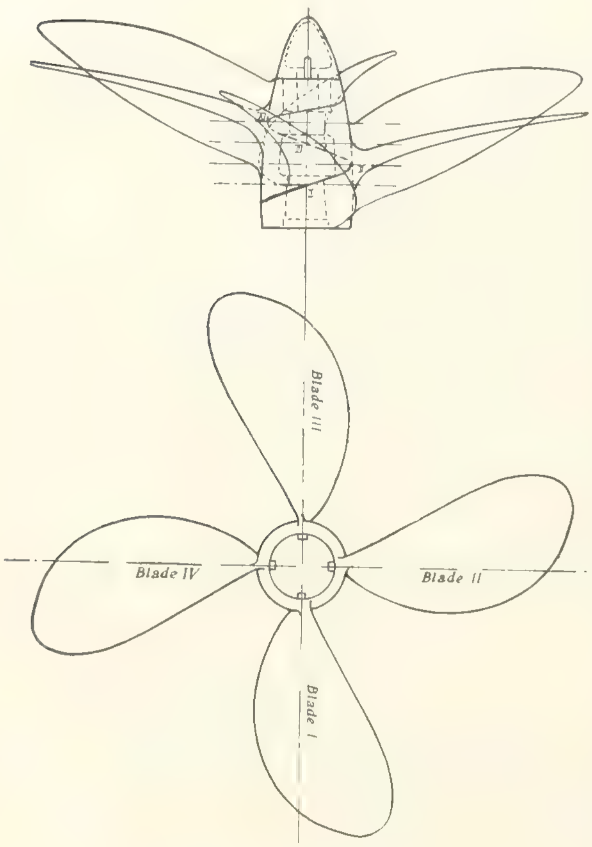
The "NIKI" Screw Propeller on the Yacht "Tarasp."

wide blade ends and with narrow ones; propellers cast in one piece, and others with blades bolted to the hub. There are propellers which are fixed, and those which can be adjusted as regards their pitch; and invention of His Royal Highness the Grand Duke of Oldenburg, who has conceived the idea of a screw propeller in which the single blades should not, as is usually the case, lie in a plane at right angles to the

shaft, but themselves be placed in an advancing screw line, having the same direction of pitch as each blade. The shape of the blades themselves has nothing to do with the invention, which consists in the screw-like arrangement of the blades themselves. These, of course, call for a longer hub than is ordinarily necessary; but the increase in length is so slight that it offers but little constructive difficulty, even in the case of very large screws with removable blades.

So much for the difference between this propeller and the various other types. Now for the advantages claimed therefor.

The first is the lessening of that bugbear of the marine engineer, the slip, and the consequent proportional increase in the useful effect; as the losses by



Construction Drawing of the *Niki* Screw Propeller.

friction and side displacement of the water do not increase by reason of this axial displacement as when slip is lessened by increase of blade surface and diminution of screw diameter.

The Grand-ducal propeller, which we have pleasure in illustrating—the trade name of which is "Niki"—of less diameter and pitch, and smaller surface, gives with the same rotation speed and engine power greater propulsion than a normal propeller—that is, one in which similar wings are arranged in a plane—of greater dimensions. For steamers such as run on the Elbe, Orinoko and other shallow rivers, and for tugs, this matter of decreased diameter is of great importance, as this class of vessels usually has screws with too small diameter in proportion to the pitch and the engine power, and the only thing to do is to give them great surface so as not to make great speed necessary.

But for all that the "Niki" type seems destined to be of service for high rotation speeds, as here the diameter must be small in proportion, in order to do away with the evil of too high peripheral speed; and this brings with it a great amount of slip; also, high peripheral speed causes a great amount of so-called "cavitation," or the formation of hollow spaces, as at such speeds the atmospheric pressure, plus the hydraulic pressure, is insufficient to cause the water to follow the front or "suction" side of the blade, and this reduces the efficiency of the propeller. The greater the slip, the greater also the unfavourable effect of cavitation; and in this particular the "Niki" screw design is favourable.

Further, the axial displacement of the blades with regard to each other prevents the formation of a ring of empty spaces, which at very high speeds permits racing of the engine.

There is naturally a reason for the axial displacement of the blades, and it is to be found in the fact that the water can more readily reach the various parts of the screw. The suction is less, and the water thrown more directly to the rear; so that with less speed of the water the same axial pressure is exerted on the screw shaft.

These qualities increase the manœuvring properties of a vessel fitted with such a screw; starting and stopping being rendered more easy. In stormy weather and heavy seas, when ordinary propellers work with low effective value and high slip, the "Niki" screw has shown itself very advantageous.

The screw is in use on some of the vessels of the North German Lloyd, Hamburg-American and Oldenburg-Portugal lines. The *Seydlitz*, of the Lloyd line, showed greater speed at the same time with coal saving; the useful effect being between 8 and 9 per cent. greater than with the old screw; further, she could be stopped in 160 seconds and 2½ lengths, whereas before 190 seconds and 3½ lengths were necessary.

The German Government boat "*S* 122" was increased in speed 0·7 knots by the change to the "Niki" screw. The tug *Bremen* showed one-third increase in towing capacity.

The following table gives details of tests made with this vessel with the "Niki" and the ordinary types of screw:—

With the "Niki."

T.P.M.	I.H.P.	Towing speed. Km.	Resistance of the tug itself.	Average strain on the line. Kg.	Efficiency.
193·2	85·503	10·4	12·4	962·5	0·503
183·75	78·350	10·37	12·38	937·5	0·542
183·15	78·250	9·36	9·05	1057·5	0·540

With the Old Type of Screw.

T.P.M.	I.H.P.	Towing speed. Km.	Resistance of the tug itself.	Average strain on the line. Kg.	Efficiency.
165	84·8	9·725	9·6	846	0·486
167·4	84·6	9·8	9·8	865	0·409

MR. WILLETT BRUCE'S STEAM WHISTLE.

THE quick manipulation of a steam whistle to indicate the movements of steamers by crisp, clear blasts is most desirable, and the rules of the Board of Trade on the subject emphasise this. Hitherto the study has been directed more to clear the whistle steam-pipes of water by means of automatic drain connections, but the arrangement brought out by Mr. Willett Bruce, R.N.R., Superintendent Engineer White Star Company, is a considerable advance over the usual methods which have been produced to meet the conditions. The apparatus used in connection

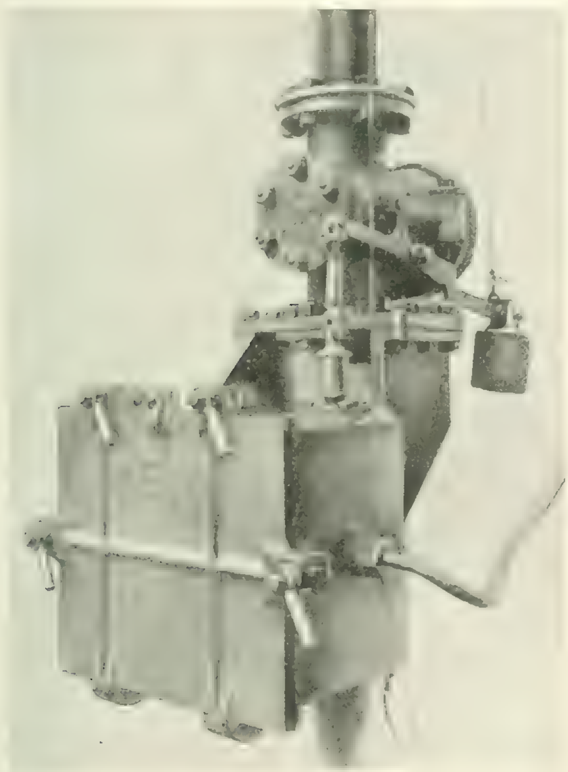


Fig. 1.

with the arrangement in question consists of a specially designed steam-valve chest, a motor-driven automatic timing switch, an electro magnet, a light brass water-tight casing for containing the details liable to damage by exposure, and water-tight bridge switches.

The valve is designed to suit the high steam pressure now used in marine boilers. The valve chest is fitted at the fiddley base of the funnel near where the cravat is situated. There is, as is not found in most of the modern steamers, an efficient means for draining the steam supply pipe, so that there shall be no accumulation of water at any time. The drain is in operation automatically, being open when water is in the pipe and closed when steam only is present; the drain can be set either into the waste steam or an exhaust tank. The actuating or pilot valve on being opened admits steam to act on a piston, to the rod of which is

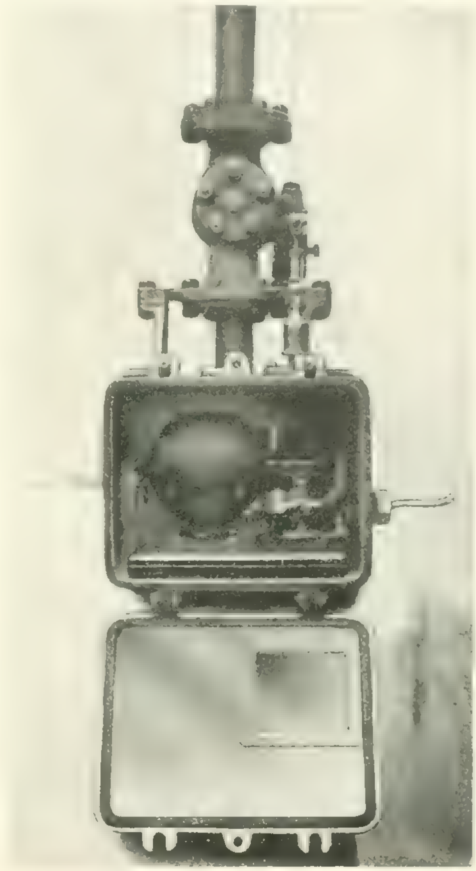


Fig. 2.

attached a control valve; this in turn admits steam to the whistle. To meet the requirements of time-signal-

Fig 3

ling an electric series-wound motor, with its armature spindle extended and bearing a worm, is fitted, and

by means of a geared wheel and pinion a radial arm comes into contact every fifty-two seconds, giving a time blast of eight seconds; these intervals can be modified or arranged to suit other conditions as may be desired. The motor and timing switch gear is all suitably mounted and secured to a light brass box base plate, the terminals for the wires being placed in the most convenient position so as to be easily accessible. The gearing wheels are run in an oil bath to reduce friction and minimise attendance. The current required for the gearing is about 2·5 amp., and the whole is efficiently protected from

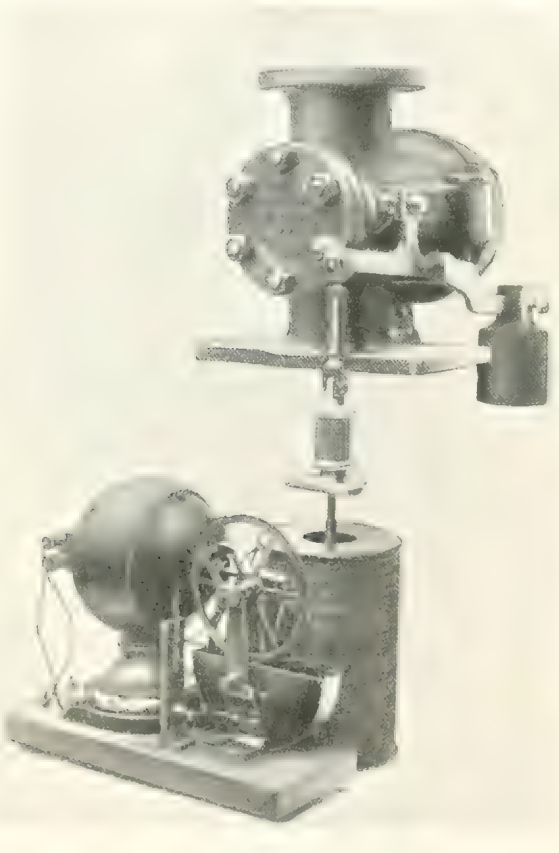


Fig. 4

the weather influences. The water-tight casing is of brass, light, but of ample strength to meet the requirements, fitted with hinged door, brackets and connections to secure it in position.

The bridge switches are of brass and water-tight to protect them. The markings on the plate are "Time control," "Silent" and "Signal control," the first being for the automatic timing and the last to suit the desired signal. The total weight of the apparatus varies from one to two cwt. according to the size of the operating valve. The advantages are that the whistle is under sensitive and absolute control, the action is decisive, the whole system is reliable, the troubles due to condensation of the steam are eliminated, the blasts are therefore clear and distinct, the whole arrangement is compact and readily accessible as to the details, the working parts are grouped together, and the ordinary means of operating the whistle by hand are available at all times and under all conditions should anything occur to necessitate these means being required for service independently.

Our illustrations show in Figs. 1 and 2 the general arrangement with door closed and open, Fig. 3 the electro motor and timing switch, and Fig. 4 the general arrangement without casing.

Several of these apparata have been supplied to Messrs. Harland & Wolff for new tonnage building, and any information required regarding same may be obtained from the agents, *viz.*—Thomas Downie, 5, Castle Street, Liverpool; or Robert Bruce, 4, Lloyd's Avenue, London, E.C.

THE THAMES CONSERVANCY MOTOR LAUNCH "THAMES."

FOR some time past the Thames Conservators have found the small motor launch of considerable assistance to them in their duties, and the experience gained with the boat *Thames* delivered by Messrs. Thornycroft in the late summer has demonstrated the advantages to be derived from the use of larger craft of this description.

This launch is 45 ft. long by 8 ft. beam and 2 ft. 7 in. draught. She is carvel-built of mahogany, with frames of American elm, decks of Kauri pine stem and sternpost of English oak, and keel of American elm.

The whole of the scantlings are of sufficient strength for sea or river use, as the launch is intended for patrolling the

Thames from Oxford down to the mouth. A cabin is fitted aft which contains w.c. and wash basin, pantry with shelves and sink, saloon with table, lockers, etc.

The boat is provided with a folding canvas hood forward and canvas awning over after well, the motor being protected by a mahogany casing with hinged panels.

The motor has six cylinders, each with a diameter of $4\frac{1}{2}$ in. and a stroke of 5 in., developing 45 B.H.P. at about 1000 revs. per minute. The cylinders are of close-grained cast iron and water jacketed, the circulating water being provided by a pump of the rotary gear type.

Lubrication is forced by means of a pump. A reversing gear is fitted of the Thornycroft type in conjunction with a solid propeller.

The diagram shows the launch on the Thames running her trials, when she accomplished a speed of twelve miles per hour.

THE FLEETS OF THE MAIL LINES.

(From our Own Correspondent.)

The Loss of the "Republic."

WE are now able to look at and discuss this serious loss—for serious it is, that one of the dozen largest ships in the world with her cargo and passengers' luggage should go to the bottom of the Atlantic—with perhaps a clearer view than those who merely had before them the Marconigrams from the various ships, which succoured the wounded vessel. First of all there is no doubt that Mr. Marconi's invention, and further, that ingenious appliance, the submarine bell, have proved their value once and for all. Look at what took place. We have dense impenetrable fog—though I notice that in their libel filed in the suit in the American Courts against the owners of the colliding steamship *Florida*, the atmospheric conditions are described as "clear, with patches of haze" until immediately before the catastrophe occurred. We have, I say, dense fog, and that growing steadily worse. We have a vast number of persons in a sinking ship. Not only is motive power gone, but there is no steam to work the pumps, to supply light, or even to blow the whistle to call assistance. If such a state of things had occurred, say, ten years ago to such a vessel no one would ever have suspected that any thing was wrong until too late; the ship would have sunk and left a few boats and some rafts tossing on the rising sea. A passing steamer would have eventually picked these up or they might have rowed themselves to the Nantucket Lightship, and Europe and America would have been thrilled with horror at the news cabled through of a disaster unprecedented for loss of life. But Marconi's genius, and the practical ingenuity and courage of Jack Binns, of the *Republic*, and the endurance of Mr. Tattersall, the wireless telegraphist of the *Baltic*, changed all that. Stricken though the *Republic* was—though injured her wireless apparatus, Mr. Binns succeeded in sending up a cry for aid and in getting replies before the full terror of the situation was realized. Soon it was known in the ship that their need was known to and realized by the big sister ship *Baltic*, by the swift mail steamers *Lucania* and *La Lorraine*, by the *New York* and *Furnessia*, and that all these vessels were hastening to assist, guided always by the direction of the Hertzian waves from the *Republic*. The knowledge that succour was at hand must have greatly assisted Captain Sealby and his officers in the fulfilment of their task in keeping order, though to my mind one of the finest incidents in the whole business seems to have been the patient courage of the *Republic's* passengers. They had not the excitement and the occupation to distract their minds from the possibilities of the situation which kept Binns and the officers and men of the *Republic* orderly and steady. Yet, we are told, they formed up on the deck and stepped into the boats as if on parade. When hundreds of people taken casually and at haphazard from presumably the wealthy and leisured classes—the classes whom now it is the fashion to attack so bitterly as selfish and pleasure-loving—will face the music with the courage of the troops on board H.M.S. *Birkenhead*, there is

The Loss of the "Republic."

The *Florida* as she appeared on her arrival. (See *Fleets of the Mail Lines.*)

no room to talk of the degeneracy of the Anglo-Saxon stock.

That the discipline and management of the *Republic* is a feature common to all vessels under the White Star flag is evidenced by the performance of Capt. Ranson, of the *Baltic*, who safely removed to his own ship from the *Florida*, not only the whole complement of the *Republic* passengers, but also—and this was no doubt far more difficult—the terror-stricken Italian emigrants of the *Florida* herself. The silver medal which the committee of Lloyd's has bestowed on the captain of the *Baltic* is a well-deserved acknowledgment of a feat absolutely without precedent in the annals of the sea. In a rising sea, in fog and darkness, nearer two thousand than one thousand persons, most of them terror-stricken landsmen and frightened women and children, were transferred without accident from a damaged ship to the decks of a liner, which towers like a fortress above the sea, without accident or loss.

But whilst the actions of Mr. Binns and of Captain Ranson are properly recognised, the heroism of Mr. Lagg, fourth engineer of the *Republic*, should in no way be lost sight of. He was on duty at the time of the collision. Realizing the seriousness of the position he rushed round to the main boilers and opened the feed valves before the rising waters reached them.

In the current issue illustrations are given showing the damage caused to the *Florida's* bows after colliding with the *Republic*, and the *Florida* as she looked on her arrival.

The Loss of the "Republic."

The *Florida* showing damage to bows after ramming the *Republic*. (See *Fleets of the Mail Lines.*)

The Fleets of the Narrow Seas.

The extension of the turbine system is causing many orders for those who manage the fleets of the narrow seas. The success of the Great Eastern Railway Company's turbine steamers *Copenhagen* and *Munich* led the Queenborough and Flushing Line to place orders for three such vessels with the Fairfield Shipbuilding Company some little time ago. Now the Belgian State Railways, who have had experience of the advantages of the system in their own fast mail steamer, the *Princesse Elizabeth*, have ordered a couple of similar vessels from the Cockerill Company of Hoboken, from whom

they have had so large a proportion of their fleet. These ships are to be on the station next year, and it is to be hoped that their advent will induce the management to get rid of some of their earlier vessels, which are now quite unfit to carry passengers, and whose lying-up charges can be nothing but a drag on the enterprise of which they no longer form any real part.

Some changes may be anticipated in the Newhaven and Dieppe service owing to the fact that the Chemin de Fer de l'Ouest—hitherto the partner of the London, Brighton and South Coast Railway in the venture—has been bought out by the French Government. The new management seems to be of opinion that railway enterprise should not include the running of steamers, and accordingly—though the service will be, of course, maintained in its accustomed thoroughness and efficiency—there will be changes in the ownership of those of the lines which have hitherto flown the French flag. Already the *France*, built in 1889, at Newcastle by Messrs. Schlesinger, Davis & Co., for the Chemin de Fer de l'Ouest has been transferred to the British register.

The New Cunarders.

The *Mauretania* seems to be in a fair way of justifying the hopes which were entertained that after her recent overhaul she would surpass anything that she had previously done. For one thing the propeller vibration, which was previously somewhat noticeable, has been so much reduced as to be practically negligible. Then her speed is certainly improved. Down channel she did 25½ knots on her first voyage after the alterations and up channel in her return she accomplished no less than 27·4 knots between the Tuskar and Point Lynas. But as there is a heavy tide in these waters one cannot attach too much importance to these performances. What is much more to the purpose for comparative purposes is the actual speed attained by her on the Atlantic. Outwards her passage occupied five days and two hours, the mean speed being just under 24 knots. But returning she lowered the day's record for the eastward run, accomplishing 605 nautical miles to noon on the 5th February. This means an average speed of 26·17 knots for the day, and is 20 miles more than she has hitherto done in a similar time. Her speed for the whole voyage was 25·4 knots, over a course of 2934 miles, her time being 4 days 22 hours and 23 minutes. Though a record for speed—the course being so lengthy—the voyage is not a time record. It, however, gives ample promise of better things, especially when it is remembered that it was performed in spite of moderate gales and heavy seas throughout. It may be interesting to note—especially for those who delight in big figures—that the cost of the *Mauretania's* recent improvements and repairs is put down roughly at £50,000.

The P. & O. Company's

new twin-screw steamer *Malwa* sailed from the Thames on her maiden trip on the 29th January. During her stay in the Thames the directors of the company had a large party to luncheon and to inspect the ship. I was unfortunately prevented by private engagements from availing myself of the chance of seeing the last word in Australian mail steamships. But I understand that every one who saw her was delighted with her and that electricity plays, if possible, a more conspicuous part than ever in her domestic economy. It furnishes the motive power, for example, in the ship's laundry, where some two thousand pieces a day can be dealt with. In the kitchens, too—one cannot nowadays call them galleys—it is much in evidence, the mechanical potato peeler being capable of dealing with as much as half a ton per hour. Messrs. Cairds' are to launch the *Mantua*, the last vessel of the present trio, before the end of February, and with these brings the number of their "M" class up to no less than eight vessels. The new ship is appointed to take the mails of the 16th July to Australia.

The Manchester Ship Canal.

For the first time since 1894, the receipts of this waterway show in 1908 a decrease over those of their predecessor, though it should be stated that, in spite of bad times, 1908 still compares favourably with the returns of 1906. The totals of imports and exports for 1908 show a decrease of 610,000 tons as compared with those of 1907, but fortunately for the company the shrinkage was mainly, if not altogether, in low-class traffic, paying tolls at the smaller rates. The imports of ores were 50,000 tons and the exports of coal 460,000 tons down. Thus only 100,000 tons of other merchandise was left to be accounted for in the decrease. Nearly £11,000 was saved in working expenses and so, though the receipts were down £28,610, the nett decrease was only £17,637. In looking at the capital account one sees that the authorized total is just over 18½ millions sterling, whilst only 17 millions have actually been spent. The position, therefore, is gradually being strengthened in spite of the period of depression through which the whole country is passing.

The New White Star Liners.

The lost *Republic* is to be replaced in the New York-Mediterranean line by the *Finland*, a twelve thousand ton vessel hitherto employed in the Red Star service between Antwerp and New York. She is a twin-screw liner built by Cramps, Philadelphia. But though built in the United States she has comparatively recently been placed on the British register.

The *Laurentic*, built by Messrs. Harland & Wolff, for the White Star side of the Dominion Line's passenger service to the St. Lawrence, went for a preliminary trial at the end of January. No details as to her performance are made public, and indeed one would not expect that they should be given away. But it is said that the combination of reciprocating engines for high-pressure steam and of turbines for low-pressure was so satisfactory in its results to those concerned that the decision was immediately reached that a similar installation should be provided for each of the huge vessels, *Olympic* and *Titanic*, now being laid down for the New York mail service. By the way, the tonnage of these ships is now declared as 43,000 tons each. They will thus be 10,000 or 11,000 tons larger than the great Cunarders. The *Laurentic* —though she was able to run these trials—is by no means yet complete in her passenger accommodation, and has gone back to the yard at Queen's Island, her maiden trip being appointed for the latter part of April.

Legal Decisions.

A judgment of great importance to shipowners and those who go down to the sea in ships was given on the 26th January by a strong Divisional Court of the King's Bench in the case of Gennochio *v.* Steward. The matter came up as a special case stated by the justices of King's Lynn, where Mr. Gennochio, the appellant, is an officer of the Board. The respondent was the master of the steamship *Swift*, whose owners are Messrs. R. & W. Paul, of King's Lynn and Ipswich. A good deal of wheat in comparatively large ocean steamers comes into the port of King's Lynn, but the vessels which bring it cannot cross the bar of the Ouse until they have been somewhat lightened. Accordingly it is the custom to send such vessels as the *Swift* down 10 or 12 miles to the bar to take a quantity of cargo out of the ship. When these vessels go down in this way they take with them labourers to do the work of lightening the grain. One day last year it was found that the *Swift* was going out to the steamship *Huron* off the King's Lynn bar, with a crew of seven men, some twenty-two labourers, two officers of the *Huron*, two women and a child. This made a total of thirty-four persons aboard. The ship was provided with but seven boats. Under the provisions of the Life Saving Appliances Rules made under the provisions of the Merchant Shipping Act 1894, such a vessel as the *Swift*—being a non-passenger vessel engaged in the coasting trade—ought to have carried one life belt for every person on board, and as she did not do so the Board of Trade summoned the master. The justices, however, refused to commit, though the real ground on which their refusal was based seems somewhat obscure. On the appeal it was contended that the persons carried beyond the crew were not "passengers" in a technical sense, and that the rules could only enforce the provision of life belts for passengers and members of the crew. A strong court, consisting of the Lord Chief Justice of England, Mr. Justice Bigham and Mr. Justice Walton held, however, that the rules did not go beyond what Parliament intended and that they meant what they said, *viz.*, that life belts must be provided for every person carried on board the vessel. It will be well, therefore, that the judgement be noted by shipowners, as in the event of a collision taking place in a river or estuary—and such accidents are more likely to occur in crowded waters—life might easily be lost through non-provision of a due supply of these in-

expensive, but necessary, safeguards of human life.

The finding of the court of inquiry held at Malta, for the purpose of inquiring into the circumstances surrounding the fatal disaster to the Ellerman Line steamship *Sardinia*, has now been published. No evidence seems to have been forthcoming as to the origin of the fire, though there are two probable hypotheses—one that the fire, which undoubtedly originated in the forehold, may have been caused by a lighted cigar being thrown down a ventilator, the other that it may have been due to the use of charcoal braziers placed on the tarpaulin of the hatch by the Moorish deck passengers, of whom the vessel was carrying a large number. The vessel apparently had dangerous goods in her cargo, otherwise the extraordinary rapidity with which the fire progressed would have been inexplicable. But there was no evidence of such goods being shipped, and the probability seems to be that it was got on board by wilful misdescription. On this hand much sympathy must be felt for the owners. Some difficult points—similar to those raised in the King's Lynn case to which I have just referred—appear to have arisen as to the number and character of the life-saving appliances to be provided on such a voyage where deck passengers of non-European origin are carried. Much regret is expressed that the second officer did not shout down to the engineers to stop the engines when he saw that those on the bridge were killed and that all communication with the engine-room was cut off. Moreover, though the second officer was left, he did not remain in the ship till the passengers were got off. His conduct is unfavourably contrasted with that of Mr. Hugh Owen Jones, the third officer, who assisted a lady passenger to secure her life belt at a time when severe burns on the hands must have caused him acute agony in rendering this assistance. Similarly Miss Kate Gilmore, the stewardess, behaved in a most heroic manner. Her bravery and presence of mind have met with recognition not only at the hands of the Court of Inquiry, but also from the underwriters, who have made her an official presentation.

Another Serious Disaster

was that which occurred off Caistor on the 1st February to a Trinity House boat with a crew of seven men. It had been reported that a sailing barge had on the 28th January been sunk by collision with the steamship *Dundee* off the Cockle Lightship. The wreck being in a position dangerous to navigation the Trinity House steamer *Argus* was ordered to see to its disposal. This she proceeded to do by sending her boat to the wreck with its seven men and several 30-lb. charges of explosives. Two of these charges had been successfully fired with results such as would have been expected by the experienced men who were in command of the little expedition. A third charge, however, had a most unexpected result. The houses in Caistor, 5 or 6 miles off, were shaken as by an earthquake and the awful explosion which caused it sent up a wave which is described as being as high as the masts of the *Argus*. It also damaged the lightship's gear and, of course, engulfed the unhappy boat, one man, however, Mr. Walter Bound, chief officer of the *Argus*, was happily rescued. Amongst the wreckage which the explosion sent up was a name board, from which it was discerned that the wreck was that of the barge *Good Hope*, of Rye, which was on her voyage to Leith with a cargo which comprised, besides some cement, a consignment of no less than 15 tons of gelignite—an explosive of an exceptionally powerful character. The barge's identity not being known at the time when the operations were commenced, no means were taken to avoid the disaster. Had it been known that she carried such a cargo she would have been left severely alone and a new channel would have been dredged to enable the traffic to avoid such a dangerous obstruction.

Wireless Telegraphy.

One result of the *Republic* disaster has been to encourage shipowners to see that their vessels are fitted with Marconi installations. Already the Nord-Deutscher Lloyd have ordered that nine more of their ships are to be so provided, and it is said that the United States Legislature is about to pass an Act of Congress making it obligatory upon vessels of the large kind carrying passengers to have wireless telegraphy.

In the Morgan Combine

further evidence of White Star supremacy is continually in evidence. Economy in working is being attained by gradual concentration, especially in the passenger departments, and it is now announced that at Liverpool the Dominion and American liner passenger business will shortly be centralized in the White Star office.

The American line has had its arrangements somewhat disturbed by an accident to the steering gear of the liner *St. Louis*, which broke down on her westward trip. She was fortunately well on her voyage when the trouble occurred and she was able to do her 13 knots into New York. She will, of course, be laid up for a time, but the time of year is that at which she can best be spared.

THORNYCROFT MOTOR LAUNCH "BUTTERFLY."

THIS launch, which is of a very staunch and serviceable type, is intended for cruising in the Bay of Smyrna. She is carvel-built of teak, with American elm timbers, 35 ft. long by 7 ft. beam, and with a draught of 2 ft. 3 ins. Her machinery consists of a Thornycroft M4 engine and reversing gear. This engine has four cylinders, each $4\frac{1}{2}$ in. by 5 in. and easily develops her guaranteed power of 30-B.H.P. on the Russian or Roumanian kerosene, which is the only fuel obtainable in Smyrna. The "M4" is one of Messrs. Thornycroft's latest productions, and is specially designed for arduous marine work, having specially large bearings, crankshaft and camshaft, with a very substantially designed crankcase. The consumption of fuel is about ·9 pint per B.H.P., per hour.

Motor Launch *Butterfly*

The cylinders are of strong design with ample jackets, having large doors for cleaning. The ignition is by high-tension magneto, which it has been proved gives good results with kerosene fuel. The water circulation is maintained by a well-made gear pump.

Forced lubrication is fitted with a simple relief valve, by means of which the oil pressure can be regulated as desired, and as required by the condition of the bearings.

There is a roomy cabin forward with hinged porthole lights. The decorations are in white and gold with upholstery of scarlet. The seats are provided with swing edges to give increased width for use as sleeping berths, and there is an underline w.c. and lavatory. A cooking stove forms part of the equipment, and a 7 ft. collapsable canvas boat is carried as a dinghy.

The boat is fitted with lifting slings, spray hood, awning with deep sides, as a protection against the sun, and a hinged mast for emergency purposes, which carries a balance lug sail.

Both wheel and tiller steering are provided.

The guaranteed speed of the boat on Russian kerosene was eleven miles an hour, and about $11\frac{3}{4}$ miles was easily attained on the trial spins.

THE "HORNE" STEAM TRAP.

WE illustrate the "Horne" Steam Trap in the adjoining diagrams, which we understand has been designed to supply a direct action expansion Trap capable of giving a large variation at the valve under working conditions.

In this Trap the expansive material used is neither a metal nor a liquid, but a specially prepared medium which has a very high co-efficient of expansion and has been found, unlike metal, to retain its expansive qualites when subject to high pressures for a prolonged period. In direct-acting Traps, where metal is employed as the expansive material, the opening is necessarily small and not sufficient to cope with any large amount of condensation, and endeavours to overcome this by introducing a system of multiplying levers has, as is well known, only added complications to the machine without in some cases producing the desired effect.

In the "Horne" Trap a tube 12″ long filled with the special medium and fitted with a piston, as shown in the drawing, subjected to a temperature equal to steam of even a low pressure, will force the piston outwards at least ½″, a fact which will go a long way to prove that a Trap which is capable of producing such a large variation by direct action, and without the use of multiplying levers, should have a very large field of usefulness.

It is well known that Steam Traps which work well on low-pressure steam often fail when applied for high pressure; this is caused by the heavy strain put upon the expansive parts, which, as usually designed, have to close the valve against the full steam pressure.

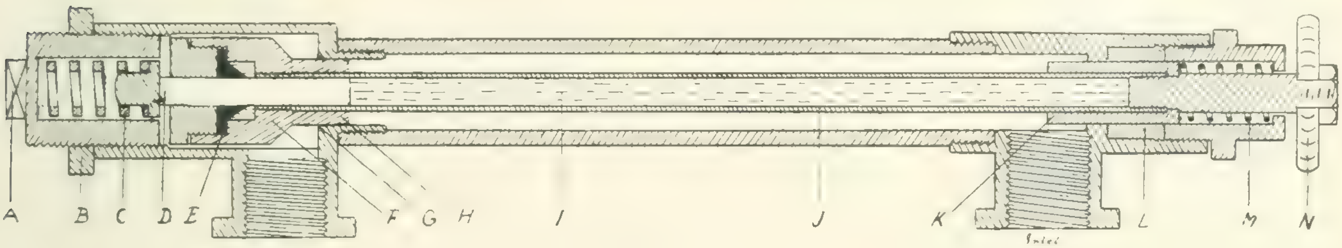


Fig. 1.

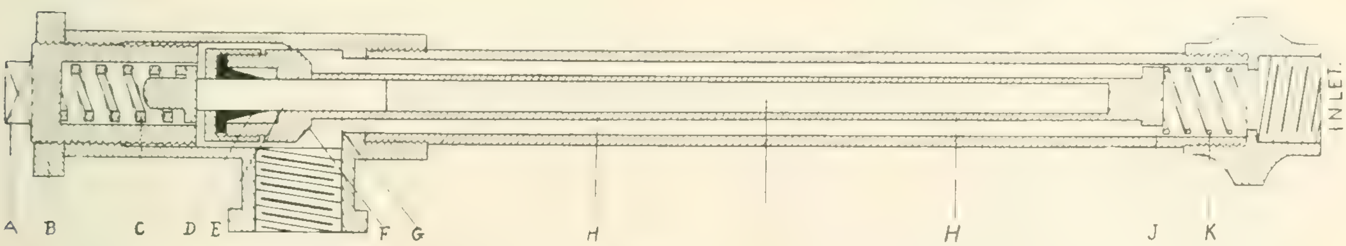


Fig 2

To meet this the "Horne" Trap is made in two patterns, for high and for low pressure, shown in Figs. 1 and 2 respectively. Dealing first with the high-pressure pattern, it will be noticed, on looking at the drawing, that by enlarging the tube, J, by the enlarging piece K, to almost the valve area at G, and by bringing it through the stuffing box, L, to the atmosphere, the pressure in the Trap is so equalized as to relieve the expansive medium, I, of any strain. By this arrangement the strain upon the expansive medium is the same whether the steam pressure be 50 lbs. or 300 lbs.

Another very important advantage gained by equalizing the strain is that, when the Trap opens to discharge the condensation water, a larger surface is exposed at the valve end of the Trap to the pressure of the steam, by this means bringing about a sudden downward pressure which forces the valve off its seats sufficiently to give a large discharge, the valve being automatically forced back on to its seat again on admission of steam to the Trap.

In order to rotate the valve on its seat whilst the Trap is under pressure, a hand-wheel, N, is provided; this enables the valve to be ground on its seat or to remove grit, etc., which may have become lodged in the valve. By pushing this wheel downwards a hand blow can be obtained at any time, the spring, C, allowing the necessary movement; it is thus possible to ascertain at all times if the Trap is working properly.

The action of this Trap is shortly as follows:—Steam entering at inlet passes through the Trap, heating the expansive medium, I, in the tube, J, which then expands and forces the valve, F, towards its seat, G. When the valve is firmly seated, conden-

sation gathers and encircles the tube, J, cools the expansive medium, I, which consequently contracts, opening the valve, F. The spring, M, being under compression, opens the valve slightly more and exposes a large area to the steam pressure, which in its turn further opens the valve by its downward pressure and thus gives a full discharge. On steam re-entering the Trap, expansion again takes place, forcing the valve back on to its seat.

The low-pressure pattern is of similar, although somewhat simpler and consequently cheaper, construction, and is well adapted for low-pressure steam when strains are not severe.

When it is desired to lift the condensation to a higher level than the Trap, it is the usual practice to place a check valve at the outlet to prevent the condensation from re-entering the Trap. This is, however, unnecessary with the "Horne" Trap, as it is so constructed that it is impossible when the valve is closed for the condensation water coming back down the drain pipe to re-enter the Trap.

A very material point in the construction of this Trap is that, in both patterns, the expansive medium is in direct contact with the steam and the condensation, and is consequently more sensitive to the variations of temperature than can possibly be the case in Traps where the expansive material is on the exhaust side of the valve. A further feature, which specially *adapts this Trap for marine work*, is its extreme lightness and small size; whereas many of the well-known patterns of "float" Traps weigh considerably over one hundredweight, the "Horne" Trap of equal power and capacity weighs only a few pounds. The entire Trap is constructed of gun-metal, the workmanship throughout aimed at being the best possible.

The London Agents for the "Horne" Steam Traps are Messrs. W. P. Jobson & Co., of 23, Great St. Helens, E.C.

INSTITUTE OF MARINE ENGINEERS.—"STEPHEN" AND "RITCHIE" AWARDS.—Associate Members, Associates and Graduates of the Institute are invited to contribute papers on the subjects for the respective grades stated below, and awards of books or instruments to the value of £2 will be granted to the writer of the best paper in each section, provided it be of sufficient merit. The subjects for each grade are as follows:—Associate Members. "The Turbine;" Associates, "Feed Heating," with descriptions of any types which have been seen by the writers; "Graduates, The functions of the Air and Circulating Pumps," with descriptions of any types which have been seen by the writers. The papers to be the certified sole work of the competitor, to consist of, approximately, 2000 words, to be signed with a *nom-de-plume* (the name and address of the writer being enclosed in a sealed envelope with the nom-de-plume written on the outside,) and to be delivered addressed to "The Secretary, Institute of Marine Engineers, 58, Romford Road, Stratford, London, E.," not later than July 1st, 1909. In the case of Associate Members and Associates, the wrapper should be endorsed "Stephen Award Paper," and in the case of Graduates "Ritchie Award Paper," the name of the member who has kindly offered this prize.

A NEW COPPER PIPE COUPLING.

CASES innumerable have demonstrated, and it is now very generally recognised, that strains arising from expansion and vibration in copper piping on board ship, especially in the case of lengths of piping having bends, are chiefly borne by the copper near the flanges of the coupling. This, conjoined to the other fact that it is just here where weakness in the piping exists as a rule, through the impaired strength due to brazing, has led to the introduction of a good many modifications on the ordinary methods of coupling and in the present notice we purpose calling attention to a new, and so far as we know, novel type of coupling which appears to have all the advantages claimed for it concerned with greater efficiency and much less cost in fitting. The coupling is illustrated by the sketches herewith. It has already been fitted on high-pressure steam piping on board a steamer built on the Clyde, after being tested by hydraulic pressure to 800 lbs. per square inch, and is giving every satisfaction.

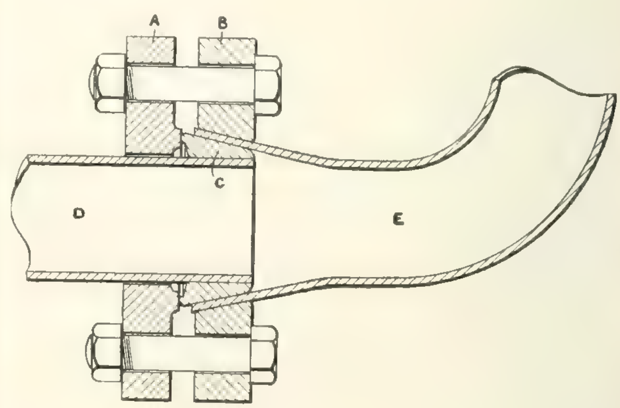


Fig. 1.

The new coupling consists of a purely metallic joint between the two meeting ends of piping, and is maintained by flanges fitted loose on the pipes, coupled, of course, by the necessary bolts and nuts. It will be gathered from the illustrations that the end of one length of piping is bell-mouthed and is drawn up on a brass conical ferrule brazed upon the other end of piping. Closely drawn up, and bearing with absolute accuracy on this softer conical piece, the two harder materials thus make the metallic joint steam and water-tight and not liable to leakage in any way. No jointing material being used, water from any condensation taking place in the piping will not impair the joint. There is no brazing required on the bell-mouthed piping, and the only brazing involved is that required in fixing the conical brass ferrule C (Fig. 1) to the end of the other length of piping. This, of course, does not punish the end of the pipe nearly so much as if an ordinary flange had to be brazed upon it. The great defect in the present method, as is well

known, is the weakening of the pipes caused by the brazing on of the flanges, and leading sooner or later to the fracturing of the pipes immediately at the back of the flanges. The thickness lost at the back of flange when in position, due to the stretch in belling the end of pipe, is very little; in fact, only about one gauge, and on smaller pipes not so much. In short lengths of pipes, joined to valves or cocks, there is no brazing necessary. The bell-mouth also lends itself to taking away any strain which may become localized on the pipe at back of flange.

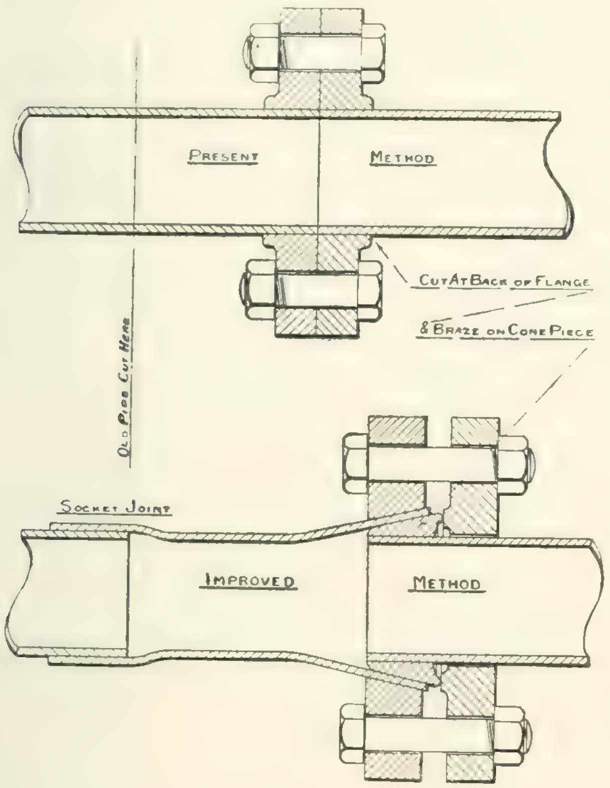


Fig. 2.

Both flanges of this new type of coupling (A and B, Fig. 1) are fitted loose on the pipes, and are made of either cast-steel or stamped mild-steel forgings. This material makes a much stronger flange, not liable to bend or to crack so easily as the present flanges, but if for any special reason brass is required, then manganese or hard brass can be satisfactorily adopted. The flanges are preferably oval in shape, for small-bore pipes especially, and require only half the number of bolts and nuts for secure fastening. These facts, and others which might be enumerated, mean a very considerable saving of time at the hurried later stages in fitting out new ships. Much, if not all, of the temporary fitting up, marking and taking down to bore and cut joints is rendered unnecessary. A big saving also to engineers and shipowners arises from the fact that no jointing material of any kind is required.

Regarding the coppersmith's time on work where these couplings are adopted there is no increase as compared with work done according to the present system. The bell-mouthing is made on the end of the pipe by means of a smooth-turned steel drift, either by hand or by hydraulic power. If done by hand, the pipe is first heated and expanded with a smooth bar, similar to the practice in making saddle branches, to within half an inch of the finished bell, and then a drift is driven up cold to shoulder of same. If hydraulic power is employed the end of the pipe is first annealed in the coppersmith's pipe-bending machine, and the drift is driven up to shoulder in one operation. In the case of smaller pipes the bell-mouthing is done by means of a fluted tapered widener, with a square on end for ratchet, the pipe, of course, being caught in the vice with lead grips. The brazing metal brass cone-piece C is first turned to taper required, then brazed on with fire-clay round turned part. No grinding or polishing is required after brazing. If flange A be made of brazing metal, the tapered piece C can be cast in one with flange.

In repair work this new coupling adapts itself very easily, Fig. 2 being illustrative of this. The fact that all flanges and cone-pieces are interchangeable for same bore of pipe is of importance in this connection. Thus at sea if one pipe from any cause bursts another pipe of same bore not in use can easily be made to replace it. The coupling is the invention of Mr. Wm. Bryce, of 17, Fielden Drive, Partick, Glasgow, and further particulars regarding this improved type of coupling, and the terms on which engineers and coppersmiths can be permitted to adopt it in their works can be obtained from him at the address given.

The imaginative faculty of Jules Verne called up to that writer many incidents and scenes which have been illustrated and have obtained realization in several directions within the past few years, and the surprises witnessed by the present generation go to show that the universe contains elements and problems awaiting development by those who devote themselves to study it with receptive mind.

THE WYNERIC.—It is seldom that the coal fever becomes so acute on board a steamer that it cannot be cured by a detour to call at a port to replenish the bunkers. The case of the *Wyneric* is one however, where on account of severe adverse weather and detention, the coal was exhausted before a port could be reached. Part of the cargo and consumable stores were sacrificed to keep steam. The woodwork of the ship also was cut away to feed the fires, and when the vessel reached Dublin she was shorn, not only of the embellishments which help to make a steamer look less plain, if not beautiful, but short of some of the comforts in housing accommodation, and even of the necessaries of life. When the *Wyneric* entered port the onlooker could realize to some extent the anxiety of and the battle which those on board must have had between sea risks accentuated by severe weather and fire risks—due not to the ordinary causes, but to the lack of something to burn—and hunger risks by reason of the protracted voyage. We are reminded by this incident of the desire manifested in these days of low margins, to get the last ton of cargo into a vessel before sailing from the loading port and to cut down the bunker coal to the lowest possible margin, consistent with safety, and with the proviso that by a slight detour a coaling port may be reached before the bunkers are too low.

NAVAL MATTERS—PAST AND PROSPECTIVE.

(From our Own Correspondents).

Devonport Dockyard.

PROBABLY by the time these lines are in print our new 19,000-ton cruiser *Indefatigable* will have been officially "laid down." The blocks are being prepared in readiness to receive the keel plate, but all depends on the date when the lengthening of the slip will be completed. Rear-Admiral Cross made an interesting speech to the members of the Devonport Mercantile Association recently, in the course of which he referred to the new vessel, which would be the "biggest cruiser the world has yet seen." The admiral also gave some figures with regard to the *personnel* of the yard, whose wages now amount to £61,795 per month. The trials of the *Téméraire* began on February 20th with a preliminary run from the Sound. On the 22nd she left for her first 30-hours' trial at one-fifth horse power and included six runs over the measured mile. On the 24th she was to have had a series of four hours' trials and on the 26th her second 30-hour trial, but I cannot say whether they were successful or not, as I am writing before they take place. The battleship *Collingwood* continues to make good progress. Her five barbettes will be ready for the mountings early in the summer and the tripod masts are also well forward. One of the rudders is nearing completion and the steering gear is well in hand. The boring out for the propeller shafting is proceeding apace and the boilers are expected very shortly. The *Hannibal*, of the Home Fleet, is undergoing a refit, which includes the fitting of magazine cooling appliances, new fire control platforms and new net defence. She is the third battleship of the *Majestic* class to be taken in hand for special refit, the others being the *Cæsar* and *Mars*. The latter vessel has been completed, as has also the cruiser *Highflyer*, which is expected later on to come in for a thorough overhaul preparatory to going on another turn of foreign service, doubtless, on the East Indies Station. The flagship *Leviathan* being required for the cruise of the Home Fleet, the new wireless equipment was not fitted during her stay in dock. She will come in later on for that to be done, when the work in connection with her fire-control fittings will also be carried out. Several of the destroyers of the Channel Fleet Flotilla are in hand. Two came in from Portland on February 4th to be docked for repairs, owing to a collision which occurred during exercises the previous night in the Channel off Portland. The *Arab's* propellers were seriously injured, and both vessels were damaged and took in water. They were able, however, to come here under their own steam, but were accompanied by the scout *Skirmisher* as a matter of precaution. The work of re-arming the *Colne* and *Liffey* has been completed and they will shortly rejoin the Flotilla at Portland. Their original armament of five 6-pounders has been replaced by three light 12-pounders, one on each side of the forecastle and one at the stern. Two of our local flotilla destroyers, the *Lee* and *Greyhound*, have been detailed for the training of the stokers of the Home Fleet. The torpedo gunboat *Circe*, which has just undergone a periodical examination of her underwater fittings, will shortly be fitted with appliances for carrying out mine-sweeping operations, and it is intended eventually to attach a group of vessels similarly fitted to each of the principal ports. Torpedo Boat No. 99 was undocked on February 9th, after being practically reconstructed. The boat, it may be remembered, foundered off Berry Head in the summer of 1907, and parted in two during the salving operations. It is believed that the salving and reconstruction will be quite justified, for the total cost has been considerably below that of a new vessel of equal value, while the experience gained has been exceedingly valuable. No. 99 is now practically a new vessel. Two of the staff of the yard—Engineer-Lieutenant Andrew, of the Engineering Department, and Mr. Watts, of the Electrical Department—paid a visit at the end of January to Copenhagen for the purpose of inspecting a coaling station which has just been built there. The Admiralty some time ago sanctioned the erection of a coaling station at Keyham, and the special advantages of the one at Copenhagen having been brought under the notice of their Lordships, the two officers were deputed to inspect it and report as to the suitability of a similar one being fitted here. Mr. Sanders, assistant constructor in the drawing office of the constructive manager's department, has also gone away, having been appointed to the battleship *Hindustan*, of the Channel Fleet, for twelve months' sea training, during which period he will have the rank of engineer-lieutenant.

Chatham Dockyard.

Our Admiral-Superintendent, Vice-Admiral Giffard, delivered an instructive speech at the recent dinner of the Medway Traders' Association. Referring to the yard, the admiral expressed his pleasure that things were going on so very satisfactorily. At present, he said, there were about 8600 men employed in the yard, which was full up with work. Many of the men were on casual jobs, and when these were finished they would have to go, but he did not think that there would be any real discharges during the ensuing financial year. It has been calculated that the wages bill up to the end of March will amount to £600,000, which will be much higher than for several years past, although not quite so large as in those years when a large amount of overtime was worked. Nothing has transpired as to the programme of work, but it is generally believed that there will be no falling off in the amount of work which will be allocated to us. The repair programme will in all probability be quite as extensive as that for 1908-9, and it is expected that provision will be made for the laying down of some more submarines. All hopes have been abandoned of a cruiser being built here. The battleship *Venerable* has been paid off from the Channel Fleet and is to be taken in hand for a thorough refit. Her crew turned over to the *Implacable*, which has taken her place in the Channel Fleet. Another battleship of that Fleet, the *London*, is expected here in March, and she is to be relieved by the *Formidable*, which has been in hand refitting for some little time. The repairs to the battleship *Africa* are being expedited and the vessel has been recommissioned for the Channel Fleet. Another expensive job is about to be commenced, that of converting the cruiser *St. George*, which has come round from Devonport, into a depot ship for destroyers. On conversion her armament will be reduced to four 6-inch and ten 3-pounder guns. Two other vessels, the *Blenheim* and *Blake*, were similarly fitted here. The *Ganges II.* (formerly the *Minotaur*) came in from Harwich on February 20th for docking and refit. The present *Minotaur* is to have her refit completed by February 26th, in readiness to rejoin the Fifth Cruiser Squadron at Sheerness. The result of the voting among the workmen on the proposal to alter the hours of work during the winter has been made known, there being a large majority against any change. Only sixty-six voted for the Admiralty suggestion, while 7796 voted against it.

Sheerness Dockyard.

The Home Fleet left on February 22nd for a combined cruise, being accompanied by the mine-laying cruiser *Thetis* and the torpedo gunboats *Jason* and *Speedy*, overtime having had to be resorted to on the latter vessel to get her refit completed. The fleet is rapidly reaching the standard strength foreshadowed by the late First Lord. The new cruiser *Defence* has replaced the *Achilles* in the Fifth Cruiser Squadron and the *Bellerophon* has been commissioned for the Battleship division. The *Superb* and *Téméraire* will also join that division before very long. The cruise of the fleet will conclude about March 11th, and then Admiral Sir William May will become the Commander-in-Chief, which is then to have the *King Edward* added to it, the whole to be known as the Main Fleet. Admiral Bridgeman will go to the Admiralty as Second Sea Lord, in succession to Sir William May, who has been on the board since he gave up the command of the Atlantic Fleet two years ago. Previous to commanding that Fleet he had been Controller of the Navy for four years. Your Chatham correspondent was in error last month when he said that the *Inflexible* and *Indomitable* were to cruise together in the Mediterranean. Something of that sort was at first expected, but the arrangements were altered and the latter vessel returned here after carrying out her firing in Aranci Bay. Her shooting with her 12-inch guns was a record, 18 bull's-eyes having been made out of 32 shots at 8000 yards. The vessel therefore now holds

the record for speed, coaling and big gun firing. The *Cossack*, the first of the ocean-going destroyers to be fitted with wireless, has been completed and has proceeded to Harwich to rejoin the broad pennant of Commodore Charlton, as have also the *Usk* and *Ettrick*. Several other destroyers of the flotilla have come in for their defects to be made good, including the *Nith*, *Ness* and *Ure*, while the *Tartar*, *Ghurkha*, *Garry*, *Panther*, *Boyne*, *Erne* and *Mohawk* are also here. There have been several mishaps to small vessels recently. At the end of January the gunnery training ship *Endymion* went on a cruise for firing exercises, accompanied by the destroyer *Bullfinch* and the special service vessel *Firebrand*. The latter vessel went ashore on a chalk bank off Margate, but was floated off and attended the *Endymion* during the remainder of the cruise. On February 1st the *Dasher*, of the Eastern Destroyer Flotilla, went ashore on the sands off the Essex coast while on her way to Harwich, but came off six hours later without any damage beyond the bending of the blades of her port propeller. She returned to Chatham, where the damage was put right in twenty-four hours. The whale boat of the battleship *Lord Nelson* was also capsized in the harbour, but fortunately all its six occupants were saved. The old battleships *Edinburgh* and *Rodney*, which have been moored in Kethole Reach for some time past, are at length to be sold. They were built in 1882 and 1884 respectively, so they might with advantage have been got rid off long ago.

Portsmouth Dockyard.

Our new battleship, the *Neptune*, it appears, will be an improvement not only on the *Dreadnought*, but also on the *St. Vincent* class. She is to be 510 feet in length and 86 feet wide, while her displacement will be just over 19,900 tons and her speed 21 knots. She will be armed with ten 12-inch guns, these being mounted in pairs in barbettes—one forward, two astern, and one on either bow. In the *Dreadnought* these give a forward fire of six guns, six astern, and a broadside of eight. The *Neptune's* inner turret will be raised, and this will enable the guns to be fired over the top of the extreme stern turret. Thus she will have an additional stern fire of two guns more than the *Dreadnoughts* and *St. Vincents*. Her anti-torpedo armament is to consist of a special pattern 4·7-inch guns. Mr. E. A. J. Pearse will be in charge of the vessel while she is being built. We have quite a heavy pressure of work, and nearly a hundred shipwrights have recently been entered, employment for most of them having been found on the new vessel. At the beginning of February there were three of the *Dreadnought* battleships in hand: the *Dreadnought* herself, which has just completed an extensive refit; the *Bellerophon*, which was being cleaned up and painted ready for commissioning (she hoisted the pennant on February 20th); and the *St. Vincent*, whose side armour has all been placed into position, while in addition a large amount of her machinery is on board. There are also the battleships *King Edward VII.*, *Revenge* and *Vengeance*, the cruisers *Terrible*, *Spartiate* and *Amethyst*, the torpedo gunboat *Harrier* and a dozen smaller vessels. The *Amethyst* was ere this expected to have been commissioned for service on the East Coast of South America and the West Coast of Africa, but examination revealed that there were considerable defects in her boilers. The vessel had been for the past two years in the local division of the Home Fleet. Torpedo Boat No. 059, which went on the rocks at Bembridge just before Christmas and was salved with some difficulty, is being repaired, having new plates fitted and otherwise made good for service. Docks Nos. 1 and 6 are being lengthened, so as to increase our accommodation for destroyers. They were built many years ago in the days of the "wooden walls." They are the oldest docks in the yard, and 1540 is said to be the exact date of their construction. About fifty feet of the fore end of each dock is being cut away, and when this is completed we shall be able to put a 230 ft. destroyer in each of them. The docks have wooden floors, which will be removed and replaced by concrete. They are to be ready for use by the summer. Rear-Admiral Bush will shortly transfer his flag from the battleship *Prince George* to the *Jupiter*, which was recently refitted. The present flagship will then be taken in hand for an extensive overhaul at a cost of £11,400, which will occupy about three months.

Pembroke Dockyard.

We had a visit from Rear-Admiral Sir John Jellicoe, the Controller of the Navy, at the beginning of February, in connection with the programme of work for the yard during the next financial year and incidental developments, amongst which, it is understood, is the adaptation of the yard for building submarines. It may be recalled that a similar departure was decided on in 1905, but was dropped after the change of government at the end of that year. The *Defence* has at length departed from this port and her departure is expected to mark a crisis in the yard's history. Since its establishment nearly a hundred years ago, vessels of the largest kind have been regularly built at the yard, but it appears as if the *Defence* is to be the last of such large vessels to be constructed in the establishment. The vessel was commissioned at Devonport on February 9th and, like her two sister ships, the *Minotaur* and *Shannon*, will go first to the Fifth Cruiser Squadron of the Home Fleet, in which she relieves the *Achilles*. The *Defence* was laid down on February 22nd, 1905, so that she was in hand a fortnight under four years, whereas the *Shannon* and *Minotaur* were laid down seven weeks before the *Defence*, the former being commissioned in March, 1908, and the latter in May. The staff of this yard must not, however, be held to blame in the matter, for the vessel had to wait two months for a navigating party before she could begin her steam trials and there was also some delay in consequence of various mishaps. Despite these, however, she has been completed within three months of the time originally fixed. The steam trials of the *Boadicea*, which were to have been completed so as to have enabled the vessel to be handed over for service about the middle of March, have had to be postponed for a month, this having been rendered necessary through the non-delivery of electric fans for the boiler and engine rooms. Pembroke certainly seems to be most unfortunate, many things seeming to conspire to prevent us completing our vessels in anything like a rapid manner. The cruiser *Bellona*, however, appears as if she will be an exception, and everything points to her being ready for launching about March 19th. The Fairfield Company, who have the contract for the machinery, are working day and night shifts to complete the boring operations for the propeller shafting and to fit the four propeller shafts and the propeller blades. The cruiser *Medusa* has been completed for her duties in Bantry Bay and has been towed round there, where she is to be permanently moored in connection with the calibration range. It does not appear as if the refit of the destroyer *Violet* will be proceeded with, as it is stated that the hull and the boilers have been found to be in such a bad state that it is considered doubtful whether she will be worth the cost of the refit. Work on the vessel has, therefore, been suspended until the decision of the Admiralty is made known.

The Honourable Corporation of Trinity House have placed an order for a steel twin-screw vessel for their service. The dimensions of the new steamer are 170 ft. by 30 ft. beam, and the machinery consists of two sets of triple expansion engines suitable for propelling the vessel at a speed of 11 knots. Messrs. Ramage & Ferguson have received the order.

The Care of Leather Belting.—In a discussion on the transmission of power by leather belting, which took place at the monthly meeting of the American Society of Mechanical Engineers held on January 12th, Mr. Walter C. Allen, general superintendent of the Yale and Towne Manufacturing Company, Stamford, Conn., gave an account of the results which had been obtained in the works with which he is associated in connection with the systematic care of leather belting. There are 4800 belts used in the factory, and it is the sole work of four men to inspect and attend to these belts. A system of bells and annunciators has been installed, by means of which the attention of one of these repairers may be instantly called to any vagary in the behaviour of a belt. Ordinary repairs not requiring immediate attention are undertaken during the dinner hour and on Saturday afternoons. Under this system of maintenance the annual cost of keeping belts in order has been reduced from 4s. per belt in 1906 to 1s. 10½d. in 1908.

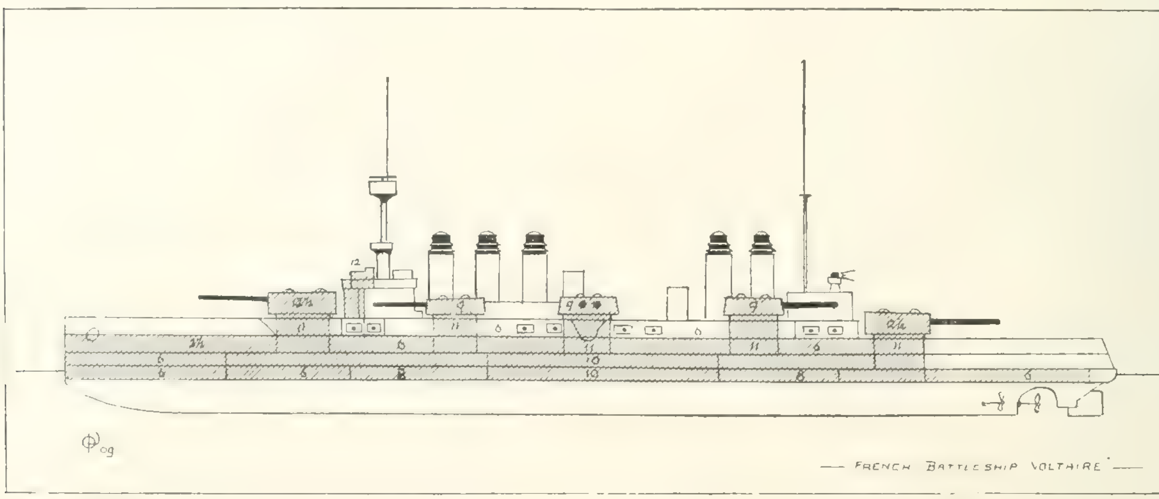
THE FRENCH BATTLESHIP "VOLTAIRE."

THE first of the six *Danton* class of so-called *Dreadnoughts* was successfully launched at La Seyne on January 16th and named *Voltaire*. Laid down in July, 1907, and designed as a reply to our *Bellerophons*, she is really but little superior to the *Lord Nelson*, which we have already passed into service and distinctly inferior to the former ship, as the table of comparison at the conclusion of this article shows.

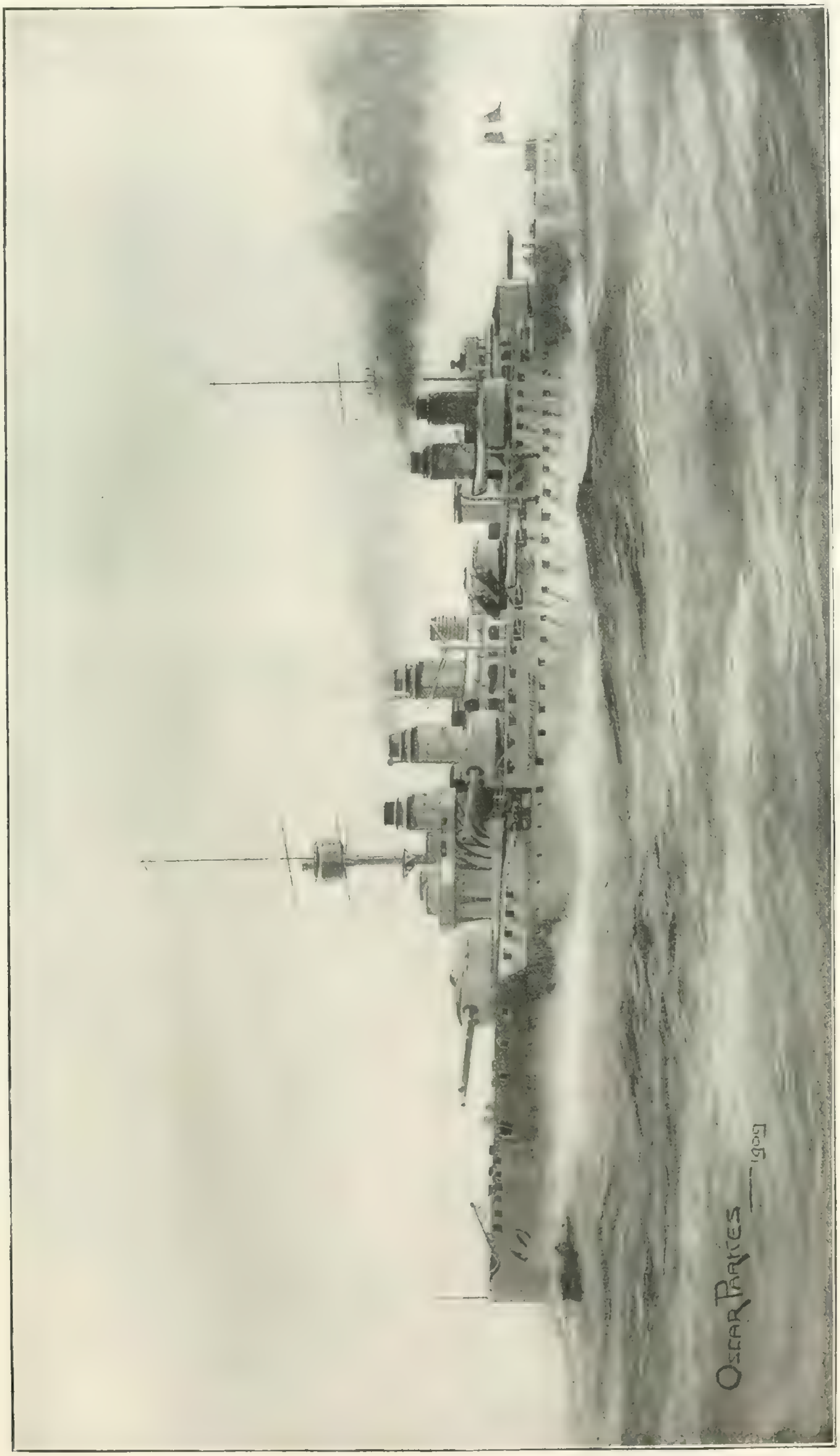
Roughly speaking, the French and Japanese are the only Powers who still retain a heavy mixed armament for their big ships, and even Japan now seems to be favouring the "single-calibre" design, if the published details of her new ships are correct. A battery of 12″ and 9·4″ guns will make accurate fire control very difficult, as it is by no means easy to differentiate between the *ricochets* of their respective projectiles, especially when all ten guns are bearing on the beam. No doubt the French 9·4″ is an excellent gun—far superior to our 9·2″—but it is a long way behind a 12″ weapon in range and penetration, so that in a duel between the *Dreadnought* and the *Voltaire* the British ship could keep out of range of the Frenchman's 9·4″ guns by reason of her higher speed, while bringing eight 12″ guns to bear against four. Of course, in a close-quarter fight the hail of medium shell from the 9·4″ would tell with devastating effect in the unprotected spaces, and it is on this account that French designers pin their faith to a mixed armament. Armour can be loosened and *personnel* demoralized by rapid medium shell fire, but in a ship like our *Dreadnought*, with her 11″ gunhouses well spaced and isolated, the effect would be nothing compared to what would happen on board the *Voltaire* when the *Dreadnought* got into range with her numerous 12″.

Turning to the question of cost, we find the *Dantons* are going to be the most expensive ships yet built in any navy, and solely because of the scandalous way in which the administration and construction (of the ships) have been mismanaged. Authorised in 1905, their estimated cost was to have averaged about £1,800,000 apiece; this was when they were to have had reciprocating engines. The success of the turbine, however, caused a suspension in their construction, while the plans were altered to allow for the introduction of Parsons' machinery. Then, again, the forward section was viewed with disfavour, as ramless ships became the fashion, and a straight bow and finer lines were decided upon. Even now the anti-torpedo armament is uncertain, although sixteen 12-pounders and ten 3-pounders are to be nominally fitted. None of these have been ordered as yet, and it is quite possible that something of 4″ or 5″ calibre will be substituted at the last minute. To illustrate the length to which French officialdom will go we may say, in passing, that the *Patrie* and *République*, commissioned in 1906, have only just had their light guns mounted, it having taken six years to decide whether 9-pounders or a mixture of 12-pounders and 3-pounders were most suitable.

To return to the *Voltaire*: In May, 1906, the plans were finally passed, the hull material ordered in December, 1906, the gun mountings and turrets in October, 1907, and the boilers in February, 1908, while the question of the small guns and magazine ventilation still remains unsettled. As a consequence the contract price has risen to £2,175,000, and instead of all six being afloat by 1910-12, we shall be much surprised if the summer of 1913 sees them in service.



As regards protection, however, the *Voltaire* will be one of the most heavily armoured ships in existence. As may be seen from the plan, her side armour is carried up to the main-deck, while the turret bases are of the heavy English type, instead of the spindle-like supports formerly so characteristic of French design. Internally the subdivision of the hull has been very carefully thought out, while there is an armour-deck above and below the belt, with lateral armoured bulkheads extending from the lower of these to the bilge-keels. As regards appearance the *Voltaire* and her sisters will be unique as the only five-funnelled warships afloat. Top-hamper has been sensibly cut down, but for all that there is still an over-large target remaining, while no provision has yet been made to protect the mast control stations from being brought down by gun-fire, as neither tripod nor lattice-work masts are to be fitted. France does not seem to have



The French Battleship, "Voltaire."

yet awakened to the necessity for something of the sort to ensure a moderate immunity from destruction of these vital stations. The method of mounting the main-deck quick-firing guns in pairs we do not care for; a single shell will put both out of action at once, whereas carried on the roof of the eight turrets, or even well-spaced singly along the main-deck, they would less likely be wiped out at the commencement of an engagement. The recesses forward certainly form most convenient shell-traps, although end-on fire could only be thus obtained with the present disposition.

The armament of the ships to follow the *Dantons* is yet unsettled, but 8 12" and somewhere about the same number of 9·4" guns is spoken of. As these will not be commenced until next year, and will have to face ships carrying 13·5" guns, we should imagine France's best way out of the difficulty would be for her to decide right now for this latter calibre and seize time a little by the forelock. Certainly a mixed armament as proposed would be obsolete before the ship was launched.

	British	British.	French.
Name.	*Lord Nelson*	*Bellerophon*	*Voltaire.*
Laid Down ..	1904	(Dec.) 1906	1907
Completed ..	1908	1908	1911(?)
Displacement ..	16,600 tons	18,600 tons	18,400 tons
Length	435 feet	520 feet	476 feet
Beam	79½ ,,	82 ,,	85 ,,
Draught	27 ,,	29 ,,	27 ,,
Guns:			
Primary ..	4 12"	10 12"	4 12"
Secondary ..	10 9.2"		12 9.4"
Anti-t.-b. ..	15 12-pdrs.	20 4"	16 12-pdrs.
	16 3-pdrs.		10 3-pdrs.
Armour:			
Belt	12"–4"	11"–6"–4"	10"–6"
Deck	2"	2¾"	3" (double)
L. deck side	7"	11"—6"	10"–6"
Big guns ..	14"–8"	12"	12½"
Secondary ..	7"		5¾"
Coal (max.) ..	2000 and oil	2000 and oil	2010
Machinery ..	reciprocating	turbine	turbine
Speed I H P	17,445 (trial)	23,000	23,000
	18.9	20.75	19·25
Complement ..	865 men	800	681
Designer	Sir Philip Watts	Sir P. Watts	M. L'Homme

Over £50,000 was expended on the *Mauretania* in her recent overhaul and refitting her lost propeller. She was about three months in dock.

North-East Coast Institution of Engineers and Shipbuilders. At this Institution on the 10th February a paper on "The scientific education of naval architects" was read by Prof. J. J. Welch, M.Sc., Member of Council.

A Scholarship for the Institution of Naval Architects.—The late Dr. Francis Elgar left estate of the gross value of £81,046, of which the net personalty has been sworn at £80,442. He bequeathed to the Institution of Naval Architects £1600 for the endowment of a scholarship. One-half of the residue of his property has been left to his widow absolutely, and the other one-half amounting to about £32,000 to her during widowhood, with remainder as to one-half to the Institute of Naval Architects for the encouragement of the science and art of naval architecture, and one-half to the University of Glasgow upon trust, for the furtherance of the objects of the "John Elder" chair of Naval Architecture in that University.

ELECTRICAL NOTES.

(*From our Own Correspondent.*)

Electrically-Propelled Boats.

To the United States we have to look for the adoption of electricity for the propulsion of vessels, examples of which are to hand in two fire floats constructed for Chicago, of 120 ft. long by 28 ft. beam and 15ft. deep, with a draught of 9 ft., 6 in. The steam turbines, centrifugal pumps and electrical generators are amidships, there being at each side of the engine room a 660 h.-p. horizontal Curtis turbine on a shaft of which is mounted a 200-Kw. shunt-wound, 275-volt, direct-current generator, the switch-board being in the centre where all connections are made. Near at hand are also two controllers for the two screws. There are also two exciter and lighting sets on the engine room floor of 25 Kw., and supplying 125-volt direct current to the steam turbines. Either of these sets is sufficient to carry the entire excitation and lighting load. Near to the stern are the large driving motors mounted on the propeller shafts, and these machines are of the variable speed reversing type, giving off 250 H.P. at 200 revs. per minute. The method of speed varying is to alter the excitation of the generator by the voltage applied to the armatures, the controllers governing on reversing the exciting current supply to the generator fields. The motor fields are connected directly across the exciter buss bars and are thus maintained at a practically constant excitation, while the circuit breakers are handy for the man in charge. We need not describe the pumps for fire purposes, but the two boilers are in a compartment in front of the engines, the working pressure being 170 lbs. The boats are provided with electric equipment, and a search light operated by current from one of the exciter sets. Steam-steering gear is provided, but regulation is depended on by manipulating the controllers. The generators are mounted on the shafts of the turbines operating the pumps, the impellers of the pumps running idle when proceeding to the fire. It will be observed on this system everything is controlled, from the pilot house, without communication to the engine room, and, therefore, in a difficult waterway there is greater ease of manipulation than is usually obtained with steam, it is claimed. It will be noted the system employed is direct current, whereas for large powers alternating current would be necessary, and it remains to devise some method of regulation of this type of motor such as we have described for direct current before progress can be made.

Metallic Filament Lamps.

There are well-known drawbacks in carbon filament lamps. They have high-power consumption per candle power which rises during life, and the filament, as is well known, produces in time a coating on the globe, thus reducing the power of the light. The competition of gas and these drawbacks have been the cause of the introduction of the metallics, of which there are two general classes, the tantalum and the tungsten. There are differences between the two, but they may be said to be alike when compared with the carbon filament type. It is possible to have a metallic filament of an ordinary lamp as much as 2 ft. in length, by the system of looping arranged for, and so intricate is this that if a breakage occurs it is said that by tapping the globe with power on a loop will take a fresh connection with another and so continue the lighting. This may even be repeated, but we know that with a carbon filament lamp any mishap is unremediable. The energy consumption for the metal filament lamp is 41 per cent. of that of the carbon lamp for the same rate candle power and the quantity of light superior. The metallics, too, will stand a variable voltage better. From the construction of the filament, as might be imagined, the tests of spherical candle power work out better for the newer form and give a better all-round distribution. The results are so good that a tungsten lamp can compete with an arc type, and figures are given to prove this. The difficulty is that, as at present made, they are for low voltage only, and until a high voltage metallic is put on the market we shall continue to have the carbon lamp with us, and perhaps even then it will not become extinct all at once. Tests of

metallics go to show they stand well and do not lose much efficiency after 1000 hours. A point about them is that they must not be used above normal voltage or there is a loss of candle power. This is obviated, however, by using a higher-rated lamp than is required.

Flame Arcs Lighting.

While incandescent lamps have been remodelled the arc lamps have not stood still—the flame arc being well to the front. In an ordinary arc the ratio of the upper carbon accounts for a great proportion of the incandescence, but in the flame arc the light is due to the luminous vapour, and the efficiency is given by the salts with which the carbons are impregnated, it being possible to vary the colour according to the nature of the salts used. Yellow is the colour mostly in demand, and this is given by calcium fluoride added to the carbons; quite 30 per cent. of the light efficiency is due to this luminous vapour.

Electric Hydraulic Pumping.

In a paper recently read a system of hydraulic pumping for docks is described, in which electricity is the motive power instead of steam. The installation is at Bristol and the motors run at 240 revs. at 500 volts., giving 125 B.H.P. Reduction gear is used between each motor and set of pumps, the ratio being 1 : 6. The system of control is the novelty, and in this case consists of a switch-board in the pump house and three relay switches in the accumulator house. The starting switch is of the long-screw type, having 50 to 60 contacts. These contacts are carried from a travelling bridge worked up and down by the screw. The screw is rotated by a Lundell reversible motor, a regulating switch being provided for adjusting the starting speed of the pumps. There is no step for regulation between 240 and 360 revs., but the screw starter is provided with contacts in its full "on" position, which prevents the field regulating switch from rising until all the starting resistance has been cut out and thus ensuring that the motors shall start with full field strength no matter how rapidly the accumulator may be falling. The arrangement is such that when Nos. 1 and 2 sets of pumps are switched into circuit No. 1 will start after, say, the accumulator has fallen 3 ft. If the demand continues by the accumulator further falling, No. 2 will start. If still more power is required and the accumulator descends, No. 1 will go on top speed first, while a further descent brings No. 2 on top speed. There is complete automatic regulation according to power needed. Any further information may be obtained from Messrs. Holmes & Co., Newcastle, the makers of this gear.

We are informed that The Dexine Patent Packing and Rubber Co., Ltd., have opened a warehouse and stores at 74, South Castle Street, Liverpool, where they carry a large stock of their high-pressure jointing, manhole rings, etc. The branch is under the management of Mr. Charles Wilson, for many years a resident in Liverpool.

PROCESS FOR UNITING LEAD SHEETS, PIPES OR GUTTER WAYS.—A new and simple process for uniting lead sheets, pipes or gutterways has been introduced to our notice, and we have witnessed a demonstration with results which were very satisfactory. The material used for joining the lead is tinfoil, which is made in rolls similar to the thin lapping in use for electric cable joint covering. The sheets which it is desired to unite are placed either with the edges butting or overlapping, the tinfoil is then laid along a scraped strip of each sheet, heat is applied either from the flame of a blow lamp or a hot iron, the tinfoil melts when the lead is only in a plastic state and perfect cohesion and amalgamation is obtained. In order to unite two pipes a brace and special bit is used, one end of the latter is adapted to form a female cone in one pipe and a male cone in the other, the tinfoil is lapped round the male cone, it is then inserted in the other pipe, and the application of heat sufficient to melt the tinfoil completes the union of the two pipes. Attempts to tear the joined portions asunder showed that the process is one which can be relied upon to give excellent results, whether used for sheets or pipes. The joining of the two pipes commended itself as not only a strong but a neat job, and the process is one which lends itself not only to new work and fittings, but to repairs.

THE DENNYS' SOUVENIR.

DUMBARTON has for ages had a history closely associated with its castle and the rock on which it stands. The past year has been witness of controversies as to proprietary rights in relics and other questions affecting the castle which, in the days of old, would have led to a battle-royal and the arbitrament of the sword; but happily the adjustment of the difficulties will now-a-days be much more rationally effected.

During the past century Dumbarton has been brought into prominence by the hammer of peace and by other means rather than those associated with the war-club, and on the height of its modern fame the name of Denny is inscribed. It is, therefore, fitting that at the present time a souvenir such as that now before us should be issued to mark the growth and progress of the land under the shadow of the rock since the days when William Denny started the nucleus of what has since become an establishment known wherever ships are found the world over, and still bearing the name of the founder above its portals, under which the third and fourth generations in lineal descent pass to and fro. Soon after the *Charlotte Dundas*, at the east end of the Forth and Clyde Canal at Grangemouth, and the *Comet*, at the west end, proved to some extent the capabilities of steam power for water-borne traffic, William Denny became convinced that the progress of navigation lay in the adaptation of this power by systematic improvement in the working parts of the machinery, and in the form of vessel best suited for the new development. In the year 1814 he built the first steamer which plied on the Thames, the *Marjory*, progenitor of the London to Margate sea route, dear to the heart of the modern tripper. Going further to sea soon afterwards, the *Marjory* crossed the English Channel and became the property of French owners. About four years later the *Rob Roy*, of 90 tons, was built and traded between Glasgow and Belfast. Subsequently leaving the Irish Channel for the French coast line, this vessel, as the *Henri Quatre*, did duty as a mail packet between Dover and Calais.

William Denny and his sons carried on business till he died in 1833. He was succeeded as head of the house by his son John, who only survived his father by five years. The fourth son, William, who was following up the same line of business as his sire, became in 1842 manager of the shipyard of Robert Napier at Govan, on the south bank of the Clyde. He was afterwards joined by his brother Peter as assistant. William's next move was to America, then famed for smart sailing vessels and showing a stronger disposition to adopt the coming power of steam than there appeared in Britain,—from the greater number and larger size of steamers already built in the early years of steam navigation. Alexander, who had

THE DENNYS' SOUVENIR.

General View of the Leven Shipyard, Town of Dumbarton and Valley of the Leven, from the Castle Rock.

T.S.S *Kyarra* in Wet Dock.

THE DENNYS' SOUVENIR.

View of Wet Dock, Saw Mill, Iron Sheds, etc., also East end of "Dumbarton." (From the Castle Rock.)

In the Dock are the Turbine Steamers, *Lhasa*, *Londonderry* and *Loongana*

THE DENNYS' SOUVENIR.

The Woodyard, Dumbarton.

established himself as a naval architect at Paisley, was joined by his brother Peter after his experience at Govan, and in 1844 William, returning from America, joined his brothers, and they opened up a business in Glasgow as naval architects. They then acquired premises at Dumbarton, where operations were resumed in shipbuilding, and in 1845 their first steamer under the new partnership was built and named the *Loch Lomond*. The Woodyard, where William Denny, senior, first broke ground, being in the market, was now taken over by the brothers, and in extended premises they continued to prosper. On the retirement of Alexander Denny in 1849 the firm of Denny Bros. was dissolved. Another brother, James, now returned from America and joined with William, when the firm became known as William Denny & Bros. Up till the year 1850 the steamers had been engined by outside firms, but in this year Peter Denny united with John Tulloch, of Greenock, and John McAusland, of Dumbarton, and started engine works under the name of Tulloch & Denny. The new firm soon made a name to itself by a progressive policy. The works manager, Mr. R. B. Pope, worked out designs for compound marine engines, and the first steamers fitted were for the Cunard, the Austrian Lloyd and the Peninsular and Oriental Companies. The increasing sizes of the steamers now demanded a development of the launching facilities, and, after some difficulty with the Town Council, private enterprise took up the subject and the necessary improvements were made. Not only did the two firms, who were so closely associated in business, prosper and extend their sphere of operations till, by 1854, the shipbuilding firm had launched forty-five vessels, some of these being of 1,500 tons, while the engine works had built engines of 300 n.h.p., but the town had also grown and prospered.

The Dennys have ever taken a keen interest in their workmen, and with a view to provide good accommodation and homes for families, suitable houses were specially built in a selected district, which was named appropriately Dennystown.

The death of William Denny in 1854 was a great blow to both firms and the district, where he had endeared himself to the people. The Civil War in America brought a large amount of work to the Clyde, and Dumbarton had its share. When Mr. Tulloch retired from the engine works in 1862 the name of the firm was changed to Denny & Co. The eldest son of Peter became a partner in the shipyard in 1868, and those who knew William Denny will remember him for his sterling worth, as well as for his excellent work and great ability. We mourn over his premature death in 1887 as we recall his face to our memory.

The name of Dr. Peter Denny is one which will never be forgotten by engineers. There are memorials of him deeply engraved in many places to indicate that he had that goodwill for his fellowmen without which no one who attains to position and influence can be looked upon as having reached the standard of true worth and manhood. Dr. Denny died in 1895. Other partners who have joined the firms from time to time have maintained the prestige and the honour associated with the name, and have devoted themselves to work and labour outside the circles of business life, in connection with Parliament, social reform, improvement of the race, and associations for the advancement of technical science. Walter Brock, referred to in our obituary last year, was largely instrumental in forwarding the advancement of the engine works, and the policy of progress, which has been a marked feature of the firm, especially in connection with the development of the Parsons turbine for marine work. The introduction of this type for river and cross channel traffic, with its further development for ocean service has been largely due to the enterprise and forethought of Messrs. Denny and Co. The present partners in the shipyard are Messrs. James, John M., Peter, Archibald, and Leslie Denny; Messrs. John Ward and Daniel Jackson; and in the engine works Messrs. James, Peter, John M., Archibald and Leslie Denny; Messrs. John Ward, R. B. Pope, who had been works manager many years, Walter Brock (son of the late Walter Brock and brother of the late Henry Brock) and Daniel Jackson. Mr. James Denny is President of the Institute of Marine Engineers, and Mr. John Ward is President of the Institution of Engineers and Shipbuilders of Scotland.

Institution of Naval Architects.—The ballot papers in the election of new members of the Council of the Institution of Naval Architects have been issued. The annual meeting of the Institution will take place on Wednesday, March 31st, and the two following days in the Hall of the Society of Arts, John Street, W.C. The Right Hon. Earl Cawdor, president, will occupy the chair.

The White Star Liners.—The reported success on trial of the new combination reciprocating and turbine engines of the White Star Dominion liner *Laurentic* has led the owners to adopt this system of triple-screw propulsion for both the *Olympic* and *Titanic*, the 45,000 ton steamships intended for the line.

Institute of Marine Engineers.—Mr. Durtnall's reply to discussion on "Electrical Transmission of Power" will be given on March 15th, with lantern illustrations.

The Institution of Civil Engineers: Students' Meetings. At the Students' Meeting, held at the Institution, on Friday, the 8th January, at 8 p.m., Mr. Bertram Blount, Assoc. Inst. C.E., in the Chair, Mr. K.W.S. Mitchell, Stud. Inst. C.E., read a Paper on "Portland Cement: the Effect of Fineness with Aëration on its Strength." An interesting point brought out by the Paper was the large increase in surface area covered by a fixed quantity of finely ground cement over that covered by a like quantity of coarsely ground cement; thus enabling a larger amount of aggregate to be covered by the finely ground product. A good discussion followed, in which the following gentlemen took part: Y. G. Lovegrove, H. T. Tudsbery, H. C. A. Thieme, H. G. Williams, W. R. Smith, D. G. French, A. S. Quartermaine, R. F. B. Gaudin, C. J. Guttmann, and J. M. S. Culbertson.

THE T.S. SHALLOW DRAUGHT RIVER STEAMER "PASO DE OBLIGADO."

WE are pleased to be able to give below particulars of the twin-screw shallow-draught river steamer *Paso de Obligado*.

This vessel is one of five under construction at the Woolston works of Messrs. John I. Thornycroft and Co., Ltd., to the order of the "Marina Mercante Argentina," a company recently formed for developing navigation in that and the surrounding country, and especially to tap the rich region through which the Parana, Uruguay, Paraguay and other rivers run.

The dimensions of the *Paso de Obligado* and her sister vessels are 220 feet in length, 33 feet breadth, 8 feet draught; and a speed of ten knots is anticipated under ordinary working conditions.

The machinery consists of two sets of inverted triple-expansion surface-condensing Thornycroft type engines, steam being supplied by two marine type return-tube boilers.

The hull is built throughout of S.M. steel, and the vessel will be classed 100 A1 Lloyd's.

To facilitate handling cargo several powerful winches will be installed on each ship; while to provide for lengthy freights—such as timber, etc.—specially large cargo hatches have been made.

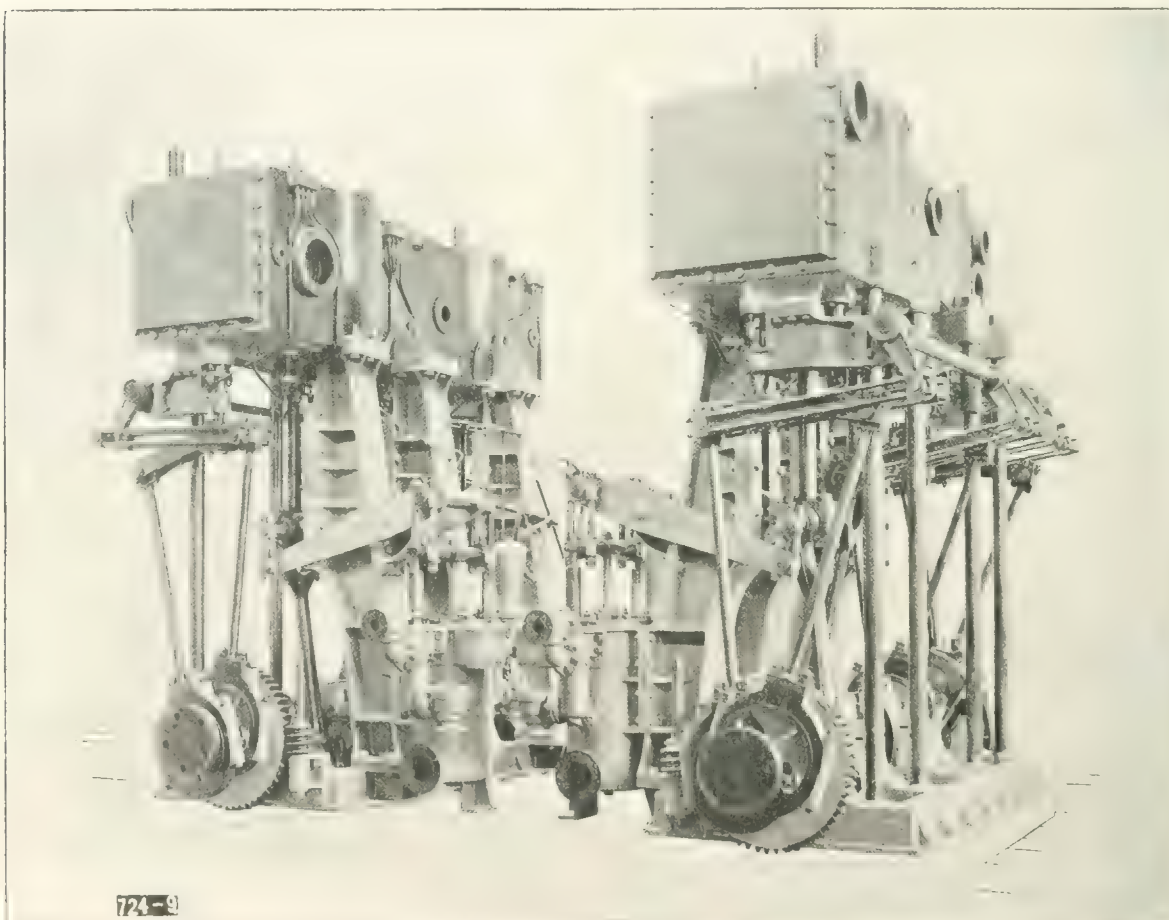
The arrangements generally are such that the boats are particularly adapted for working in the very hot climate met with in the northern parts of the rivers.

All five vessels will be navigated to Buenos Ayres under their own steam, and their fuel capacity is ample for such a journey.

The new company (the Marina Mercante Argentina) is of special interest, as its formation has been solely due to the desire of interested people in the country to have a line of steamers which are national property.

During the official trials those of the vessels which have been completed easily obtained the speed of 10 knots with 140 revolutions per minute on a coal consumption of 1½lbs. per 1 h.p. per hour. The first vessel, when fully opened out and carrying the official load of 730 tons, obtained a speed of 11¼ knots per hour as a mean of six runs on the Admiralty measured mile at Stokes Bay; and the voyage to Buenos Ayres occupied 34 days' actual steaming. The vessel steamed out at a specially reduced speed for economical reasons, and consumed about 40 tons less fuel on the voyage than was estimated.

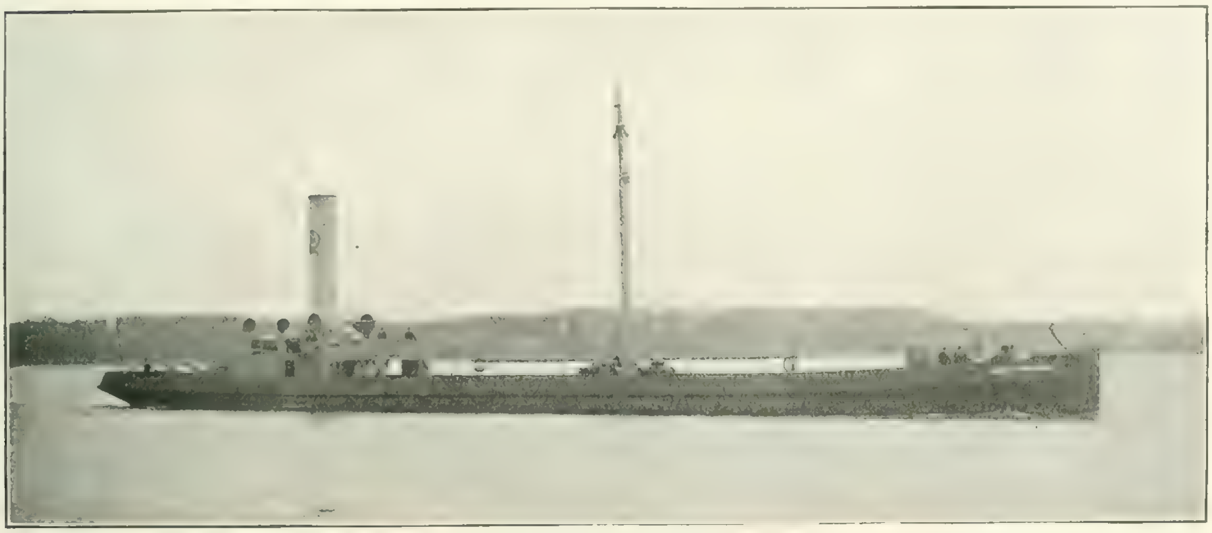
Our illustrations show the *Paso de Obligado* and her machinery.



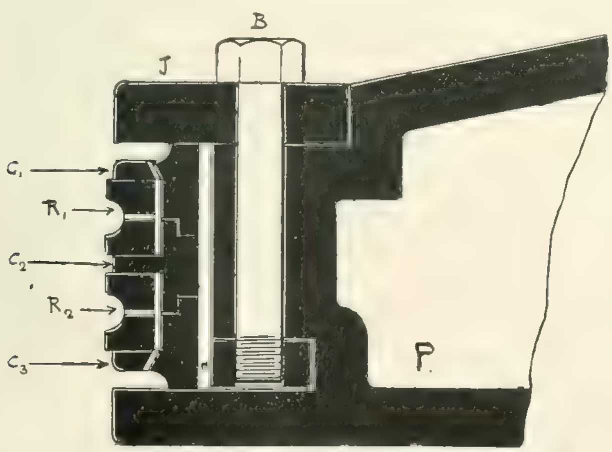
Machinery of the *Paso de Obligado.*

EQUILIBRIUM PATENT PISTON RINGS.

Of the making of piston rings, like the making of books there seems to be no end. Most of the patent piston rings depend upon springs to force the ring against the cylinder walls. This method has several serious disadvantages, the principal of which are that even the best-made springs, when subjected to constant tension, tend to lose their elasticity, and the high temperature of the steam at which so many of the modern steamers are worked cannot be conducive to the retention of the temper of the springs. Again the pressure of the rings against the walls of the cylinder is a fixed quantity, depending on the ideas of the engineer who has the work of setting the rings after an overhaul. At the beginning of a voyage the rings are hard against the cylinder, setting up a frictional resistance which requires considerable power to overcome, and at the end of a long run they must be more or less slack, which means that there will be a more or less serious leakage of steam past the piston. When the steam pressure is low there is as much force exerted outwards as when the steam pressure is high, consequently the percentage loss due to friction is higher at low power than at full power. To remedy these two last faults there is no course open to the engineer in charge but to bear the loss or to take his cylinder cover off and re-adjust the springs. This, of course, is almost impracticable.



The *Paso de Obligado.*



Equilibrium Patent Piston Rings.

In these days, when competition is so keen, and ships have often to take long voyages light, on the chance of procuring a full cargo home, the shipowner who wishes to make a profit at the end of the year has to look to a number of small things which were formerly thought to be of little or no importance. One of these things is the question of piston rings. Many superintendent engineers have recognised the failings of the ring which depends on springs, some have come to the conclusion that the problem was insoluble and have in consequence adopted a solid piston ring. This does very well for a short time, but after it has worn slack there is no way of making it tight again, without fitting a new ring.

Messrs. P. Baker & Co., Cardiff, are the proprietors and makers of a ring which claims to have overcome all the faults of the spring expanded ring, and at the same time to have all the advantages of the solid ring.

The section of the piston and rings shown in the adjoining illustration will make the claims as to merit clear. "P" is the body of the piston, "J" is the junk ring, "B" the junk ring bolt, screwed into the nut "N." "C1, C2, C3," are the carriers, and "R1 and R2" are the equilibrium piston rings.

Steam is admitted to the back of the rings by the small holes in carriers C1 and C2. The ring would be forced outward with a considerable pressure were it not for the fact that there is a small hole which communicates between the back of the ring and the annular groove which runs round the face of the ring. The greater part of the outward force is balanced, and for any ring the outward force depends upon the steam pressure. It will be seen that there can be only one ring in action each stroke. Thus on the downward stroke the steam forces out the top ring, and on the upward stroke it forces out the lower ring.

The advantages are that the outward force is independent of any mechanical appliance, and depends on the steam only. Thus no matter how high or how low the steam pressure may be the engineer knows that the piston rings are being kept up to their work. There can be no tampering with the rings by anyone, as there is nothing about them which requires adjusting. At the end of a long voyage the force pressing out the rings will be the same as when the voyage commenced. As the outward force is dependent entirely on the steam pressure the outward force at low powers will be less than at high powers, consequently the loss due to friction will be about the same percentage for all powers. The makers claim that the Equilibrium Rings are more easily taken out for examination and replaced than those of other designs.

Lastly it would seem that with the small bearing surface which the rings present to the cylinder, any wear which takes place will be on the rings rather than on the cylinder, and as the rings are balanced the wear must be exceedingly small.

This type of ring has also been adapted to suit piston valves.

Through pressure on our space we are compelled to hold over our articles on *Boiler room equipment* and *Electricity on Board Ship.*

A paper on "The Effect of Bossing upon Resistance," by Professor H. C. Saddler, D.Sc., was read on the 23rd Feb. by that gentleman at the Institution of Engineers and Shipbuilders in Scotland, and at the same Institute discussion on Mr. Andrew S. Biggart's paper on "Bridge Building" took place.

We are advised by the Cambridge Scientific Instrument Company, Limited, that they have taken over the sole rights of sale and manufacture outside the American Continent and Germany of the thermometers, gauges, etc., of the Hohmann and Maurer Manufacturing Co, and the regulators of H. & M. Automatic Regular Co., of New York.

The annual meeting of members of the Institute of Marine Engineers will take place at the Institute on Friday, March the 19th at 7 p.m.

ON HEAT LOSSES.

(III.)

(*Continued from page* 208.)

IN treatises dealing with the heat engine the Willans test is invariably referred to, as proof that high speed reduces initial condensation, but the fact is entirely overlooked that Willans discarded the old style of slide valve, and that, together with efficient drainage, must be taken into account when initial heat losses are in question, and if, in marine practice, high speed carried with it the same substantial benefits as in stationary practice the matter would assume another aspect.

Suppose, for example, it is proposed to install a dynamo that, for a certain output, requires an armature of 300 in. dia. to be driven at 80 R.P.M. It is obvious that when coupled directly to the engine the unit would occupy considerable floor space and head room, and this entails a heavy capital charge at the outset, and this is where the high-speed engine scores, and at the same time emphasises the immense difference between dynamo and propeller driving. Unlike the propeller, the dynamo loses not a whit of its efficiency through being run at a high speed—rather the reverse.

The diameter of an armature varies in an inverse ratio with its revolutions. If we substitute one of 37½ in. dia., and drive it at 640 R.P.M., we have the same output as the large unit, but occupying only a fraction of the floor space and head room, required by the slow-running set. This alone puts the superiority of the high-speed engine, for dynamo driving, beyond question, but for driving the propeller of a huge, full-lined steamship, it is an entirely different proposition. The dynamo is the finished product of an exact science, but the propeller is still in the experimental stage, for notwithstanding the care and thought bestowed on it, the only thing certain is its uncertainty. It has been tried at tens, hundreds and thousands of revolutions per minute, but the ideal propeller has not yet materialised, and whether it must be run fast or slow the most economical method of driving is now, and will be always, of the first importance. In this connection there is one point of outstanding interest in the Willans law which has not received as much attention as it deserves, namely, that with a constant ratio of expansion, mean pressure varies with the initial pressure. By Fig. 1 (page 206), it is seen that the difference in pressures from main steam pipe to cut-off is 9½ lbs., and this by the above mentioned law represents a loss of 13·1 per cent, in mean pressure. In Fig. 2 the difference is 19½ lbs. equal to 11·5 per cent loss. In Fig. 3 it will be noticed, there is absolutely no loss.

It has also been shown in Figs. 1 and 2, that an increase in pressure of 101 lbs. advances the expansions from 7·1 to 12· or 69 per cent increase, both engines having the same crude and unscientific method of steam distribution as was used by our forefathers; whereas, in Fig. 3, where some attention has been given to temperature as well as pressure, and initial heat losses reduced by separating steam from exhaust, and again separating the exhaust from the cylinder, an increase of only 48 lbs., but with full pressure maintained up to cut-off, advances the expansions from 7·1 to 19· or 167 per cent. increase. It is noteworthy that this rate of expansion has been exceeded only when the pressure was advanced to 260 lbs., with elaborate and costly fittings.

The above diagrams are from engines in first-class order, so that the 11½ per cent. loss in mean pressure is rather below the average with triple engines in the merchant service, but in warships with reciprocating engines, the loss is often 20 to 25 per cent.

These losses have been variously ascribed to wire-drawing, cylinder walls, surface and extent of clearance volume, slow speed, defective valve gear, etc., etc., together and separately, and elaborate formulæ deduced in order to account for the "missing quantity," but the slide valve as a factor has not been included, nor the external surface of cylinder enveloped by exhaust steam. The slide valve especially, contributes largely to the loss account.

In none of the elaborate engine tests is there any record of the weight of steam condensed in the receivers having been measured. On occasion, and with the engines at rest,

the losses due to radiation have been estimated, but this in no way meets the case when the engines are running.

It has been found by experiment that when the slide valve glands can be kept water-tight, a different thing from steam-tightness, as every engineer knows, the water accumulates in the receiver until it reaches the edge of the steam port, all added thereafter being swept into the cylinder with the entering steam.

The slide valve, as fitted in marine engines, takes various forms, but essentially it is a rectangular box with live steam outside and exhaust steam inside, the plate between them being ½ in. to ⅝ in. thick. We have here an ideal state of affairs for the rapid transmission or abstraction of heat—a thin plate, with the fluids on either side moving at a high velocity, and with a considerable difference in temperature.

A double-ported slide valve for a 42-in. cylinder has an exhaust cavity aggregating 8·5 sq. ft. of surface exposed to live steam at 315° F., on the outside, and to 237° F. inside or 78° difference. The cooling surface in the condenser for

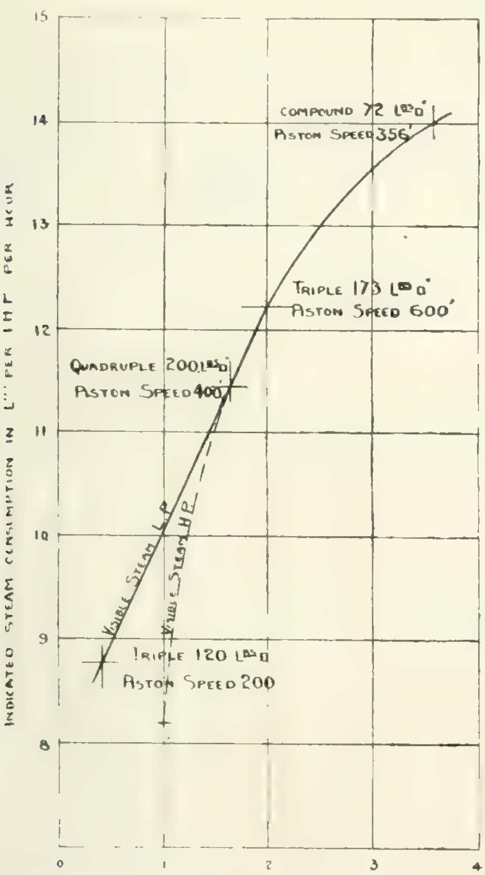


Fig. 4

Missing Water in lbs. per I.H.P. per hour.

this engine, is at the rate of 1·3 sq. ft. per I.H.P. with sea water at 84°, discharge water 114°, and exhaust steam 146°, or 32° difference. The widest temperature difference in condenser is sea water 84°, exhaust steam 146°=62°, so that the difference is 78° in the receiver, while there is only 32° difference between the discharge water and exhaust steam, and 62° between sea water and exhaust steam.

Joule, in his condensing experiments, succeeded in condensing 1·66 lbs. of steam per minute per sq. ft. of cooling surface. Particulars of this experiment are not at hand, but it appears that velocity and direction of flow of the cooling fluid were the prime factors. In the above condenser the velocity of circulating water was about 200 ft. per minute, with condensation at the rate of ·16 lbs. of steam per minute per sq. ft. of surface. In the receiver the fluids move at an approximate velocity of 4,500 ft. per minute, so that the condition as to velocity is fully met, and if that of direction is not fulfilled, it is compensated for by the commingling of the cooling fluid due to circuitous passages. We are assured by those competent to judge, that the thickness of metal separating the fluids—unless it exceeds ⅝ in.—does not affect the result to any extent. Under these conditions it is obvious that the slide valve surfaces will have a much higher condensing value than an equal unit in the condenser; and this value lies between ·16 and 1·6, with a mean of ·88 lbs. of steam per unit, and varies with the difference in temperature. The difference at slide valve is 78°, and using this as a multiplier we have then 8·5 sq. ft. by ·78 lbs. per minute by 60 minutes=397 lbs. of steam condensed in H.P. receiver per hour.

The exhaust cavity of the L.P. valve has an area of 14·8 sq. ft., steam temperature 237°, exhaust 160°, or 77° difference, The cooling fluid here has a velocity of 7,000 ft. per minute; we have now 14·8 by ·77 by 60=683 lbs. of steam condensed per hour in L.P. receiver, and the heat transmitted meanwhile to exhaust is utterly wasted. When this engine is running the L.P. receiver drain is kept full open, and it barely suffices to keep the water below the steam port.

The consumption of steam measured from diagrams is 14 lbs. per I.H.P. hour. Owing to condensation in main steam pipe, the H.P. receiver is supplied with wet steam, and coming in contact with comparatively cold surfaces, at constant pressure, a considerable amount liquefies. During admission further liquefaction takes place, faster than the steam can enter, in fact, with the result that at cut-off 13·1 per cent. of it is lost entirely as far as expansion is concerned.

The weight of steam condensed in receivers is 397+683=1080 lbs. per hour, and this is 7·4 per cent. of the indicated steam, and 13·1 per cent. initial loss added to 7·4 per cent. receiver loss equals the "missing quantity," so that the actual consumption is 17·61 lbs. per I.H.P. hour, and the missing water 3·61 lbs., or 20·5 per cent. loss.

The steam consumption by diagrams Fig. 2 is 12·25 lbs. per I.H.P. hour. Temperature differences at slide valves 70°, 62°, and 65°, the weight of steam condensed in receivers is 590 lbs. per hour, and is 2·77 per cent. of the indicated steam. Loss at admission is 11·27 per cent., which gives an actual consumption of 14·25 lbs. per I.H.P. hour, and the missing water 2· lbs or 14·0 per cent. loss.

A quadruple engine shows an indicated consumption of 11·43 lbs. per I.H.P. hour, and by above method the actual consumption works out at 13·08 lbs. per I.H.P. hour, and 1·65 lbs. missing water, or 12·6 per cent. loss.

The triple engine, Fig. 3, has neither receiver nor admission losses, its only loss being that due to the wetness of the entering steam, but it is re-evaporated to some extent, as there is ·6 lbs. more steam indicated in L.P. than in H.P. This, however, requires the expenditure of heat in the jackets to the extent of 23 per cent. of the total steam (12 lbs.), the actual consumption being 9·2 lbs. per I.H.P. per hour, and there is ·4 lbs. of missing water, or 4·3 per cent. loss only. The steam used by jackets has been kept apart, because it will be shown later that the same economy can be attained without jackets.

The relation between indicated steam and missing water, and the influence of the latter on economy, is shown graphically by Fig. 4.

	Indicated Steam.	Missing Water.	Actual Consumption.
(1)	14·0	3·61	17·61
(2)	12·25	2·0	14·25
(3)	11·43	1·65	13·08
(4)	8·8	·40	9·20

From the foregoing it is easily seen why the "missing quantity" increases, or appears to increase, at light loads, because, with a constant ratio of expansion the receiver condensation is constant whether the engine is running with full or no load, and piston speed does not and cannot reduce the loss.

Superheating reduces the loss only when the volume of the steam is extended beyond the demand made on it in receivers.

The following rules can be used for calculating the total consumption of steam from indicator diagrams:—

$$\text{(I.)}\quad \frac{I \times B}{C} + 60\,(A_1\,T_1 + A_2\,T_2 \text{ etc.}) \text{ where}$$

I. = Indicated steam in lbs per hour
B. = Boiler pressure.
C. = Pressure at cut-off.
A_1 = Area in sq ft of exhaust cavity in 1st M.P. slide valve.
A_2 = „ „ „ „ „ 2nd „ „ „
A_3 = „ „ „ „ „ „ L.P. „ „
$T_1\ T_2\ T_3$ = Difference of temperature in degrees Fah. ÷ 100 between steam and exhaust sides of slide valves.

$$\text{Or (II)}\quad I \times \frac{d_1}{d_2} \times \frac{I \times B}{C} - I \quad \text{where}$$

I. = Indicated steam.
d_1 = Density of steam at initial pressure.
d_2 = „ „ „ cut-off „
B. = Boiler pressure.
C. = Cut-off do.

MUSGRAVE'S PATENT BOAT CHOCKS.

THE object of all the latest devices in boat chocks is to free the boat for swinging out as quickly and easily as possible; this is claimed in the design illustrated in the adjoining diagrams in the two positions. The drawings speak for themselves as to the construction: Fig 1 showing the boat in the chocks, and Fig. 2 the boat released from the chocks, having on the davits.

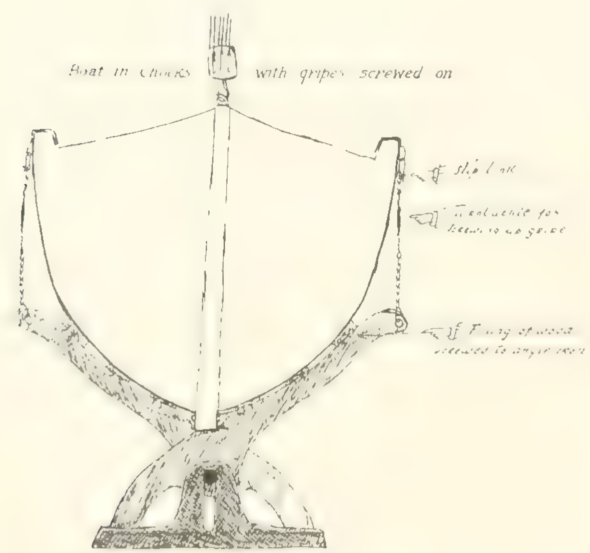


Fig. 1.

To swing out the boat there is nothing to do but slip the links that are on the gripes and the chocks (which are held in place by the gripes) fall clear, leaving the boat free for swinging out. This can be done by one man in a few seconds, where it would take six men three or four minutes to have a boat in the same position if it were landed in the ordinary chocks.

Among other advantages claimed for these chocks are: (1) Their simple construction, which minimizes their chance of getting out of order and enables any-one at a glance to see how to work them. (2) Their

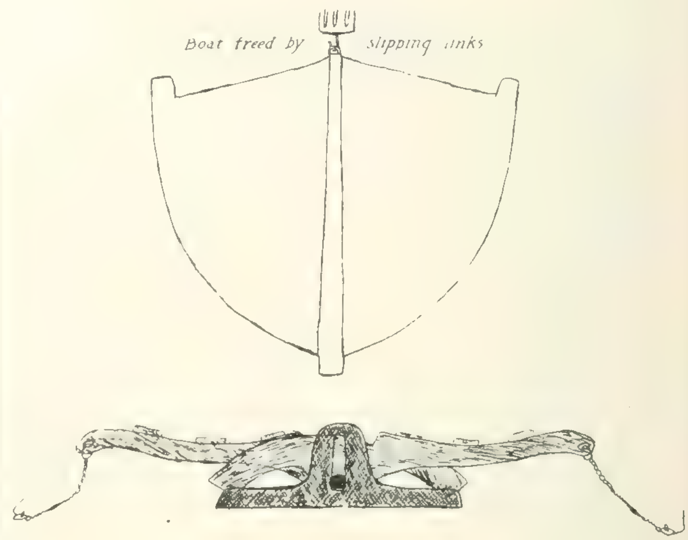
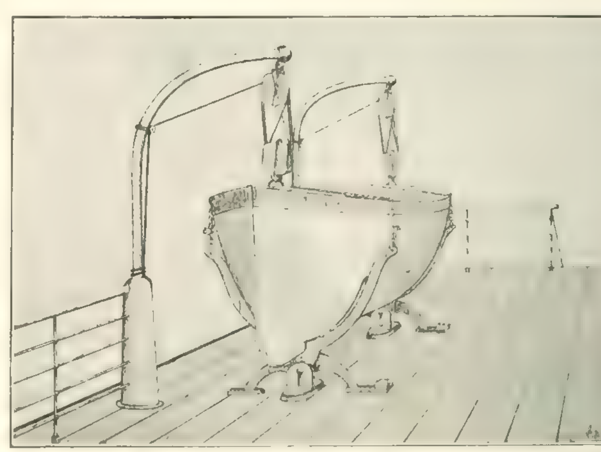


Fig. 2.

cost, which, if made of cast-steel angle-bars, is less than that of ordinary chocks, as there is no machine work about them. (3) Their adaptability to any shaped boat by altering the thickness of the wood-lining. And (4) the small cost and ease with which



Musgrave's Patent Boat Chocks

they can be fitted on any ship. These chocks are put on the market by Mr. E. Musgrave, c/o Chadwick, Wainwright & Co., 28, Brunswick Street, Liverpool, who is a chief officer, having long experience in dealing with boat inspection by the emigration officers.

JUNIOR ENGINEERS.

IN the immediate past and present state of a wide development in machine tool design, due to the introduction of high-speed steel, a large proportion of the standardized data regarding speeds of output are becoming almost antiquated except as a basis of calculation, this, of course, applying principally to the later designs of machines, rendered necessary by the increased stresses induced by the operation of the new material. With a large number of the older tools, however, speeding up has been effected, and the longer efficient life of the steel on moderately fast speeds has also tended to further its adoption.

The desirability of still retaining machines working at the slower rates is dominated by the cost of scrapping them, and in the case of comparatively modern tools it becomes necessary to keep them going and decide upon higher speeds, for or against, depending on the particular work being done. If faster rates are adopted, or what is the same thing, heavier cuts, then the duty imposed on the machine is proportionately increased, repairs and maintenance become greater and of more moment, and the useful life of the machine is shortened; it may, indeed, so prove that, as far as economy of commercial working is concerned, although the invested capital of a tool is bearing a higher productive interest, the maintenance charges and depreciation value are increased to a still higher degree, which may not be altogether balanced by the relatively lower labour cost. These considerations become of more importance if the output is going into stock and is ahead of the demand; where, however, the reverse holds and economy of time is of more value than economy of production, as with small plant working for quick delivery, then the machine capital may be adjudged as worth sacrificing, particularly where the labour cost is high.

Although these commercial factors are more accentuated in their relation to high-speed steel, the same qualifications are applicable to the rates adopted with ordinary tools. Accompanying these, there are mechanical considerations of the state, quality and rigidity of the machines and tools; the nature of the operations; particular mixtures of metals, which do not always have machining rate as a constant quantity, due to various causes; and, except in highly specialized work, the human factor must essentially play a not inconsiderable part in the rate of production. With so many varied disturbing elements involved it is not surprising that there should be considerable differences in the compromises adopted, to keep within the limits outlined and provide for other minor causes entering into the fixing of definite rates, and with these points in view it becomes almost a question of trial and error with each machine and its particular work.

Of the three variables in the functions of the milling machine —speed, feed and depth of cut—the last is the one more definitely under control of the machine hand, although it is usually settled by the exigencies of the work being operated upon. The speeds are to a certain extent fixed where there are, for instance, four steps on the cone pulley, a back gear, and a high and low-speed driving pulley, giving a range of sixteen speeds; the feeds are similarly arranged in series with either belt or gear drive; while the depth of cut is limited by the amount of stock to be removed, requiring one or more roughing cuts and a finish, or possibly merely a surface cut for finishing. The speeds for roughing are considerably lower than for finishing, as a fine surface is only obtained by rotating the cutter at high speed, and the lower rates are more economical of power for the same weight of metal removed, as the frictional resistance is almost constant at all powers and it is thus a less proportion of the total power with low speeds.

The cutting speeds are most conveniently kept in graphical form, as the variations can be seen at a glance and necessary allowances more easily deduced, while the curves, if applied to each machine operation provide a ready means for ascertaining its actual and best productive rate, and if methodical data are kept, can be readily varied to embrace specialized working. The range of speeds obtainable being a fixed quantity, the particular drives can be marked down against the corresponding revolutions or speed, thus facilitating the speed rating and avoiding unnecessary calculation.

Of all the machine tools in operation the miller is, indubitably, the most subject to varying influences, and the necessary compromises require to cover a wider and more fluctuating range. The cutters vary from two to ten inches in diameter and upwards, and may be either of the coarse type, with the number of teeth equal to fifty pitches, or fine with double this number; while if vertical rymers are used these may be as small as $\frac{3}{8}$ or $\frac{1}{2}$ inch diameter. The effect of diameter of cutter on the speeds adopted is that the smaller tools are run at higher peripheral speeds than the larger sizes, and the accompanying table with Fig. 1 illustrates the principal features of working upon which this depends.

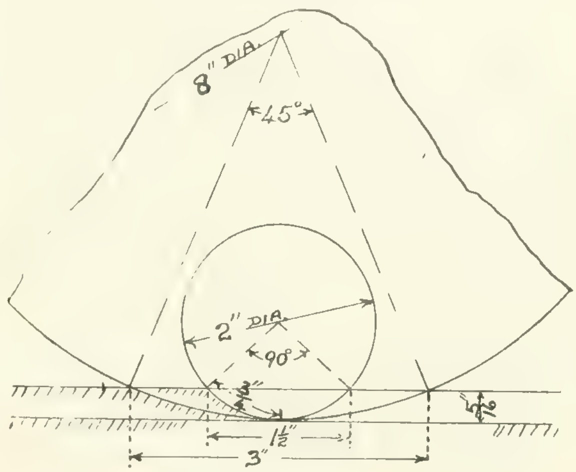


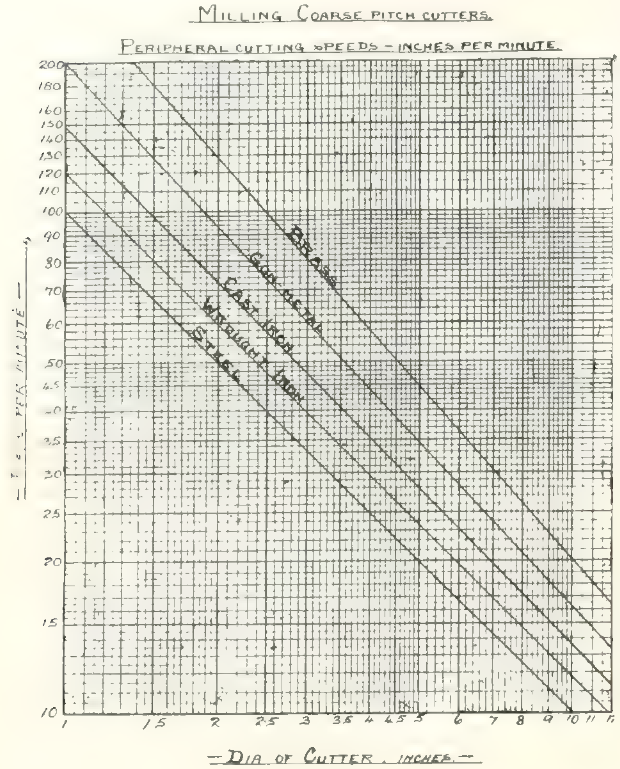
FIG. I.

	2 in. Cutter.		8 in. Cutter.		Ratio.
Circumference, ins.	6·28	..	25·13	..	1 : 4
Number of teeth	12	..	24	..	1 : 2
Pitch of teeth, ins.	$\frac{1}{4}$	..	$\frac{1}{2}$	..	1 : 2
Arc of cut, ins.	$\frac{3}{4}$	..	$1\frac{1}{2}$	..	1 : 2
Revs. per min.	50	..	12·5	..	4 : 1
Tooth working, per rev.	$\frac{1}{8}$	..	$\frac{1}{16}$	..	2 : 1
Feed per min., ins.	$\frac{1}{2}$	..	$\frac{1}{2}$	..	—
,, ,, rev., ins.	$\frac{1}{2 \times 50}$	..	$\frac{1}{2 \times 12·5}$	..	1 : 4
,, ,, tooth, ins. ..	$\frac{1}{1200}$	..	$\frac{1}{600}$	..	1 : 2

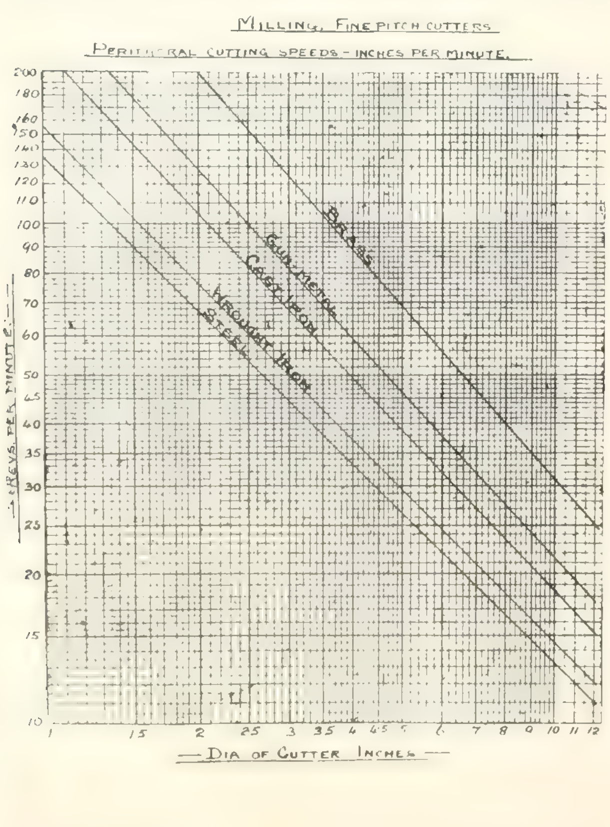
In the first place it will be seen that, the peripheral speed being 320 inches per minute, a tooth on the small cutter is in operation during one minute for a period of $·125 \times 50 \times 6·28 = 40$ inches approximately, while a tooth on the large cutter is working $·0625 \times 12·5 \times 25·13 = 20$ inches, a ratio of 2 to 1, but the large tooth has a cut of twice the length of the small one. The cut per tooth of the large cutter is fed at the same rate, but will be of twice the weight, and against this the curvature is much more gradual for the large cutter, so that the stress on the tooth is not quite double that imposed on a tooth of the 2-inch tool. Now as the distance from the cut to the arbor is 4 inches in the case of the large cutter, and 1 inch for the other, the bending moment on the arbor will be 4× the load, or an approximate ratio of 8 to 1 for the large and small tools. From this last ratio it is obvious that the tendency to chatter is very much enhanced for large diameter cutters, thus requiring efficient means for steadying the arbor in its supports.

Summing up all these considerations it is found that the larger cutters are more productive and more economical of power, and although it is accepted that the more bites a cutter must take, the greater is the power required, and the small cutter will take more bites if driven at a higher speed, usually it is found that the better result is obtained by increasing the peripheral speed as the diameter of cutter decreases. Finally the cost of the cutter must be taken into account, for as the periphery varies as the diameter, the weight of steel in the tool varies as the square, and this in the larger sizes represents a big proportion of the cost, with increased difficulty in hardening to avoid losses, so that the inserted tooth of high-speed steel has here a wide field to exploit.

The percentage increase of speed as the cutters become smaller varies for different types of tool and material operated



upon, being greater for the softer metals machined; steel is, however, commonly machined at constant speed for all sizes, although for very small coarse cutters the total increase may be fifty per cent on special work. The curves are given by an equation of the form C = zx, which, if plotted



direct, gives an inconvenient form of curve and also, as C is not a constant, requires a larger number of definite points. This is avoided by using logarithmic paper, or plotting logs simply, for log C = log z + log x, thus obtaining a straight line whose gradient is readily adjusted to varying circumstances or speeds. The two sets of curves given are calculated on this basis, and are for roughing cuts with coarse and fine pitch cutters. The finishing rates may be increased by from 30 per cent for steel to 20 per cent for brass; it is scarcely necessary to draw out graphs for these latter, as the usual practice is either to slip the belt up a step, adjust the back gear, or throw in the high-speed pulley, and the last being the most convenient renders it expedient to fix the roughing rates on the slow-speed pulley, if possible, and a table or diagram giving the revs. per minute of the arbor for each position of belt and gear is a valuable asset in this connection.

The depth of cut ranges from ¼ inch for steel to ½ inch for brass, but as before stated it is more often fixed by the character of the work than by the limitations of the machine, except that deeper cuts are possible with large cutters than with small ones.

The feed rate is thus affected by the depth of cut, and small cutters are therefore given a faster feed to make up for the loss in depth, as well as for the greater increase possible due to higher rotative speeds. The following table gives the approximation to general feed rates for the different materials.

Material.	S.	W.I.	C.I.	G.M.	B.
Feed ins. per min. ..	¼ – ½	½ – 2	½ 1½	1 – 1½	2½

These figures apply to roughing cuts at the highest rates where the depth is not excessive, and in special work with small coarse cutters may be increased by 50 per cent, but generally the slower feed is more suitable for smaller cutters, in order to keep the cutting peripheral speed up to its maximum and avaid unduly stressing the cutter or causing chattering of the arbor and tool.

The British Consul-General at Kobe reports that the Mitsu Bishi floating dock at that port, which was launched in November last, is the largest floating dock in Japan. It measures 532 feet 6 inches by 100 feet and is capable of floating a vessel of 12,000 tons, length 580 feet, breadth 66 feet, and draught 26 feet in four hours. The steel used in the construction of the dock was all manufactured at the Imperial Iron Foundry, Wakamatsu.

THE DESIGN OF MARINE STEAM TURBINES.—At the Ordinary Meeting of the Institution of Civil Engineers, held on Tuesday, the 16th February, 1909, Mr. James C. Inglis, President, in the chair, a paper was read by S. J. Reed, Assoc. M.Inst.C.E., on the "Design of Marine Steam Turbines." The following is an abstract of the paper: The first part deals with the best angles for the blades, also the shape and proportion of the blades themselves. Reference is made to the most suitable steam-velocities and the ratio these should bear to the blade-velocities. The calculations are then given for the principal dimensions of a set of compound turbines designed to develop together 10,000 shaft horse-power. The method employed is completely free from empirical formulas. It is capable of rapid handling and is equally adaptable for superheated and for wet steam. The method of calculating the thrust of the propeller is entered into, together with a few notes on the efficiency of the propellers. The manner in which this thrust is to be balanced by the steam thrust is explained. The advantages to be derived from the use of superheated steam are particularly discussed, and the alterations in design which would be necessitated by its use are indicated. Mention is then made concerning some of the principal mechanical parts of the turbine, including bearings, adjusting blocks and glands. A few notes on condensers are also given. The relative efficiencies of the turbine and reciprocating engine are dealt with and a few suggestions are made as to possible improvements. The paper concludes with a reference to one or two points that require attention in the manufacture.

Industrial and Trade Notes.

THE CLYDE AND SCOTLAND.

(From our Own Correspondent.)

Revived Activity. The improved prospects in the Clyde shipbuilding industry engendered by the contracts placed since the year began are now beginning to materialize. Berths which have so long been vacant are now beginning to be occupied, and all over there is a more cheerful stir than has obtained for a long time past. The shortened winter working hours which came into operation unusually early last year have now being departed from and full working time is being reverted to, and in not a few yards increasing numbers of workmen are being engaged.

Fresh Contracts.—Towards the end of January orders were received by Messrs. Alexander Stephen & Sons, Linthouse, from Messrs. Maclay & M'Intyre, shipowners, Glasgow, for two steamers, each of 8000 tons carrying capacity. The vessels, which are to have a speed of 10½ knots in service, are being rapidly proceeded with, as are other steamers for the same owners previously ordered from Clyde builders. Messrs. Mackie & Thomson, Ltd., Govan, received, about the same time as above, from the Anchor Foundry and Shipbuilding Company, of Nelson, New Zealand, an order for a third steamer—in addition to two contracts received late last year—and also an order from North of Scotland builders for a steam drifter. The order from the Anchor Shipping and Foundry Company is the third booked for the same owners during the past half-year, and all the vessels are specially adapted for trade on the New Zealand coast. The first of the three—the *Waimea*, which was launched on January 25th, is a twin-screw steamer of about 460 tons, length 150 ft., breadth 26 ft. and depth (moulded) 10 ft. 9 in. Engines of 600 i.h.p. are being supplied by Messrs. Ross and Duncan, Govan. Messrs. D. J. Dunlop & Co., shipbuilders and engineers, Port Glasgow, have contracted to build and engine a twin-screw steamer for the coasting trade. Two sets of triple-expansion engines will be supplied by the builders. Messrs. George Brown & Co., Garvel Shipyard, Greenock, about mid-month booked an order to build a cargo steamer 150 ft. in length, for English owners. Machinery for the vessel will be supplied by a Glasgow firm. Messrs. Lobnitz and Co., Renfrew, have recently booked, amongst other orders, one for five barges for an Eastern port. Messrs. J. G. Kincaid & Co., Greenock, have secured the contracts for the engines of two 7000 ton steamers to be built by Messrs. Archibald M'Millan & Sons, Dumbarton, for Glasgow owners; and for a 7000-ton steamer, placed with the Greenock and Grangemouth Dockyard Co., Greenock, by a Cardiff firm. The Honourable Corporation of Trinity House have accepted the tender of Messrs. Ramage & Ferguson, Ltd., of Leith, to build a steel twin-screw vessel for their service. The dimensions of the new steamer are—Length 170 ft. by 30 ft. beam, and the machinery, to be made by the same firm, consists of two sets of triple-expansion engines suitable for propelling the vessel at a speed of 11 knots.

Tramp Tonnage for Glasgow Owners.—Within the past few months a very considerable quantity of tramp tonnage has been ordered by Glasgow shipowners, a number of the vessels being now under construction, while the keels of others have yet to be laid. The orders referred to represent at least eighteen vessels aggregating 118,000 tons, while if to this are added three or four doubtful contracts the total of new tramp tonnage to which Clyde owners are committed is increased to 132,000 tons. The contracts about which there are no doubts are:—Messrs. James Gardiner & Co., five steamers of 7500 tons each; Messrs. Hugh Hogarth & Co., two steamers of 7500 tons each; Messrs. Marshall & Dobbie, one steamer of 7500 tons; Messrs. Abram, Addie & Cousins, one steamer of 5500 tons; Messrs. Thomas Dunlop & Sons, two steamers of 7500 tons each; Messrs. J. Greenlees & Co., one steamer of 7500 tons; Messrs. John Hardie & Co., two steamers of 7000 tons each; and Messrs. Maclay & McIntyre, two steamers of 8000 tons each.

Exhaustion of Work at Greenock.—An addition was made to the P. and O. fleet by the launch, on February 20th, of the twin-screw *Mantua* of 11,500 tons from the yard of Messrs. Caird & Co., Greenock. This vessel, and the *Malwa*, now completing her fitting out, are the largest vessels ever built at Greenock, and are sister ships to the *Morea* recently handed over to the P. and O. Company by Messrs. Barclay, Curle and Co., Whiteinch. With the launch of the *Mantua* the stocks in Messrs. Caird's shipyard are left empty. There is no immediate prospect of a keel being laid and it is an ominous fact that the yard will be practically closed for at least two or three months, during which period alterations and improvements will be effected in certain sections of the establishment. General report encourages the hope that before the summer is far advanced the firm will be in successful treaty for fresh orders.

Russian Naval Work for Clydebank.—On what seems to be indisputable authority the long-rumoured arrangement for the re-construction of the Russian Navy by British firms has been confirmed. Messrs. John Brown & Co., Ltd., of Clydebank and Sheffield, are the contractors under the arrangement referred to, and the intelligence has naturally caused a good deal of satisfaction at Clydebank and at Sheffield. The estimating and drafting staff of Messrs. Brown & Co. have for some time, and still are, busily engaged with the work the reconstruction involves. While the precise amount of the contract cannot as yet be stated, it is known that this will be large. The matter has been under consideration for a long time, and it is believed that the Russian Government were influenced to select Messrs. Brown for advice and designs because of the firm's success in naval work for the Japanese and other Governments. There is a stipulation that, as far as possible, Russian labour and material must be used, and this, of course, minimises the value of the contract as a source of British employment, but there is a good deal of work which must be done at Clydebank and Sheffield, and plant will be brought into use which has been practically idle for a long time. The benefits are not expected to be immediate, as payment will be spread over a period of years.

Speed Trials of Destroyer "Swift."—During the past few months much interest has been evinced in the trials of the new destroyer *Swift*, which has been periodically on the measured mile at Skelmorlie. The *Swift*, as is well known, has been built by Messrs. Cammell, Laird & Co., Birkenhead, for the British Government, and she is designed to be the fastest vessel afloat. On Saturday, January 30th, the vessel again left the James Watt Dock, Greenock, where she has berthed since her arrival on the Clyde, and went down the Firth for further tests. On this occasion the trials lasted over four hours, and while nothing can be ascertained officially regarding the vessel's performances, it is understood that the results obtained were satisfactory. The vessel burns oil fuel and is designed to steam 36 knots, as much as 38 knots indeed having, it is reported, been attained on the Mersey some time ago. That every effort is being made to attain the best possible speed results is indicated by the fact that in the trials she has undergone on the Clyde, propellers of varying design and pitch have been experimented with. During the better part of February she has been in James Watt Dock, Greenock, being refitted with still another set of propellers, the performances with which are fully expected to excel previous trials. Meantime it is claimed that the honour of the record speed at sea must still be given to the destroyer *Tartar*, built by Messrs. John I. Thornycroft & Co., for the British Admiralty. On her trials the *Tartar*, which was built as a 33-knot craft, steamed at a rate of over 37 knots, and this has been exceeded since the vessel was formally handed over to the Admiralty, a speed of 38·3 knots having been attained. Indeed, it has been reported that during some recent trials in the North Sea a speed of over 40 knots was credited to the *Tartar*. The particulars of these, however, have not been allowed to transpire, but there is sufficient data to prove that the vessel is entitled to be called the fastest afloat.

New Motor Yacht.—Mr. John A. M'Callum, naval architect, Glasgow, has been commissioned by Sir Andrew Noble, Bart., to design a 20-ton full-powered sea-going motor yacht. The vessel, it is understood, will be constructed by Messrs. P. R. MacAllister & Sons, Dumbarton, and will be used for short cruises and despatch work. The speed desired is 10 knots, and the yacht will be fitted with a Kelvin 40 b.h.p. four-cylinder paraffin engine, with Kelvin reversing gear

and solid propeller. The dimensions of the yacht are 50 ft. by 10 ft. by 4 ft. draught, and she will have a plumb stem and torpedo stern. The vessel will be built of Oregon pine, with decks of yellow pine and weather-deck fittings of teak. Ballast to the extent of about three tons will be carried, fully half of this being on an outside iron keel and the remainder of lead inside.

Rosyth Naval Base.—The official statement recently issued regarding the actual letting of the contract for the new naval establishment at Rosyth on the Firth has naturally caused great satisfaction in the East of Scotland and been received with interest over the whole country. The contract, which has been let to Messrs. Easton, Gibb & Son, Ltd., contractors, Westminster, who were originally established at Aberdeen, is divided into two sections, the first of which, comprising a submarine depot, boat slip, pumping station, and electric power house, is to be completed in four and a half years. The second section, which includes the remainder of the work, comprises large basin, having an area of over 50 acres, an entrance lock available for use as a dock, 850 ft. long, 110 ft. wide at entrances, and 36 ft. deep over sill. This dock, which is entered from the basin previously mentioned, will be so constructed that it can be sub-divided for use as two separate dry docks, and provision is made for lengthening it up to 1000 ft. The second section of the contract is to be finished in seven years, a substantial bonus being paid in the event of earlier completion. Although the scheme as now approved is complete in itself, care has been taken so to arrange it that it can at any future time be extended without interfering with anything which is done now. Besides an additional basin a number of docks of the largest size can be readily constructed, in addition to all the shore requirements for a first-class naval port.

New Type of Reciprocating Engine.—Demonstrations of the working of a new type of reciprocating engine have recently been made in the engine laboratory of the Technical College, Glasgow, where it has been installed for testing purposes. Mr. William C. Werry, the inventor, of Werry's Engine Company, London, claims for this engine that the fuel consumption is from 12 per cent. to 20 per cent. less than an ordinary engine, while maintaining an increased speed; that it is suitable for either marine or locomotive work, and that its weight is only half that of an ordinary engine of similar power. The engine at present being tested in the Technical College is of 75 h.p. and weighs only 600 lbs. A special feature of it is that its mechanism is balanced in such a manner that vibration is eliminated and smooth rhythmic running is secured, and when used to drive twin-screw propellers, in the event of either propeller lifting out of the water, the energy is automatically transferred to the other propeller, which in a side roll would be submerged. It is also claimed that the propeller speed can be maintained at a rate equal to that given by an ordinary reciprocating engine, while the piston speed is reduced by one-half.

Greenock Torpedo Factory.—Good progress has been made with the preliminary work in connection with the torpedo factory which the Admiralty is erecting at Battery Park, Greenock. The clearing of the site, extending to about 10 acres, has been an undertaking of considerable difficulty, chiefly owing to unfavourable weather, but this has now been accomplished, as well as the construction of a subway which will connect the factory with Fort Matilda, immediately adjoining. Actual building operations have now been started and it is expected that progress from this point will be more rapid.

THE TYNE.

(From our Own Correspondent.)

The Trade Outlook.—Recent political deliverances by public men have been very optimistic in tone, and many of the speeches were full almost of assurances that the dawn of the long-hoped-for prosperity was quite within measurable distance. We wish we could endorse these views, but how can anyone honestly say that the prospect of trade improvement is good when the evidence is all against such a view? It is obvious that at present the world's supply of floating tonnage is very much in excess of requirements. That is shown, not only by the continued lowness of freight, but by the great number of steamers "laid up," and by the vain efforts of certain shipowners to bring the supply of carrying accommodation more within the limits of the existing demand. The newly formed shipowner's union is in some quarters already pronounced a failure, and although we don't go so far as to say that this is literally true, we cannot say that we have much faith in the longevity of this movement.

Extensions at a Tyne Shipyard.—It is announced that Messrs. John Readhead & Sons, the well-known shipbuilders and repairers, of Tyne Dock and South Shields, are about to extend their shipbuilding yard with a view to the building of larger ships than they have hitherto built. This shows that the firm are determined to maintain the position of eminence they have already achieved by conforming to the spirit of the age, which is indisputably in favour of larger ships as freight carriers. The firm must assuredly regard the future with a considerable degree of confidence, and they would be niggardly indeed who would not wish that their confidence may be justified. It is understood that further new plant will be put down capable of dealing in the most effective manner with the heavier class of work that it is expected may come to the yard, and it is also probable that a new system of hoisting gear in connection with the building berths will be installed. Some developments are also indicated at the Elswick Yard in the direction of berth enlargement and machinery equipment, and it may be taken for granted that in the case of the last-named establishment nothing that modern science can contrive will be omitted to make its output capacity up-to-date.

Jarrow Trade.—At the Palmer Company's yard there are, we regret to say, no tangible signs of improvement, and it is now only too plainly apparent that no more Government contracts are coming just yet. This would not matter so very materially if the placing of some good mercantile orders was imminent, but there is little to justify any sanguine hopes in this direction. Luckily, the engine works and steel works are kept going, and there is also repair work in hand, so that the great establishment is still a long way from being derelict. Taking the whole of the yards at Wallsend, Walker and Hebburn, it cannot be said that among them there are many signs of animation, or that the future holds much promise of better things. Messrs. Wood, Skinner & Co. have their berths occupied, and material is being received in large quantities daily.

Engineering Work.—The announcement has been made that the order for the machinery equipment of a battleship building at Elswick has been given to the Wallsend Slipway and Engineering Co., Ltd., whose works are now second to none in capacity for dealing with the heaviest class of work. This order will have the effect of stimulating business very considerably at this establishment, and it is not improbable that some of the hands that were discharged towards the end of last year will now be taken on again. No change is to be noted in the condition of work at other establishments, and it is not to be expected that any change of importance will arise until shipbuilding orders are being placed more freely. Messrs. H. Watson & Sons, High Bridge Works, are still having several of their departments kept fairly busy in the manufacture of auxiliary machinery, and at Messrs. Parsons' turbine works there is also some amount of activity to be noted.

THE WEAR.

(From our Own Correspondent.)

Shipbuilding.—We understand that some further orders have been placed with builders on the Wear, and as the recipients had already been lucky in securing a considerable amount of work, these firms will now become pretty busy for some time. Messrs. Laing's yard still remains inoperative, and it is thought in well-informed quarters that there is little chance of a resumption before the autumn, if even then. There is a good amount of repair work in the port just now, Messrs. Robert Thompson & Sons having a big contract in hand at the South Dock, and another in their own dock at the Bridge Dockyard. The firm are also keeping busy at their Southwick yard, where there are three vessels on the stocks and one in the water getting fitted out.

Messrs. S. P. Austin & Sons are at the moment particularly busy, having the Liverpool steamer *St. Hugo* on the pontoon

undergoing extensive damage repairs, and the *Sheila*, a London steamer, passing Lloyd's survey at the quay. The steamship *Consett*, recently owned by the Lambton Coal Co., and now sold to Greek owners, is receiving repairs in the graving dock. Another steamer is moored beside the yard awaiting a new boiler, and the firm have also a vessel in the public dock requiring large damage repairs at their hands. In addition to the repair work the firm have in the building department a good sized vessel in the plating stage, and frame turning for another is proceeding.

The Sunderland Shipbuilding Co., Ltd., are about to launch a steamer that has stood on the stocks, finished, for some time. It is understood that the vessel is sold. Messrs. Bartram and Sons will launch a boat next month, and have another to commence with.

Some sixty shipyard operatives left Sunderland on the 13th inst. for Austria, having been engaged to work in an Austrian yard at Tyne wages and on Tyne conditions.

Engineering.—There is still a lack of animation at the local marine engine works, and the state of affairs at electrical works does not seem to be much better. We are pleased to note that Messrs. John Lynn & Co., of the St. Luke's Engine Works, Pallion, has a good order for steam winches of superior type, from a well-known Continental firm, and some of the winches have already been despatched. The new book illustrative of the advantages of the Wear for industrial purposes is not yet ready for publication, but will be ready, we understand, very shortly.

The North-Eastern Marine Engineering Co., South Dock, have put on a partial night shift lately, and have re-engaged a number of their old hands. This is distinctly encouraging, showing, as it does, that the company must have secured further work.

The doubled-funnelled passenger steamer *Patrix*, which was launched recently on the Tyne, has had engines, etc., fitted on board at Messrs. Geo. Clark & Co.'s Southwick Engine Works, and at the time of writing is about to proceed on her trial trip.

BELFAST.

(*From our Own Correspondent.*)

New Tonnage.—There has been but little activity in the launching of fresh tonnage since the New Year, only one vessel having been put in the water during the first two months of the year. There are, however, two or three large steamers almost ready for sending off the slips, and there is a considerable volume of new tonnage at the fitting-out wharves—vessels launched at the latter end of 1908.

Messrs. Harland & Wolff.—No launches have, as yet, taken place this year from the Queen's Island, but a large steamer building at the north end of the yard will, in two or three weeks' time, be ready for launching. The new tonnage which Messrs. Harland & Wolff have fitting out amounts to upwards of 60,000 gross register. On the 29th of January the Canadian White Star liner *Laurentic* left Belfast for a trial run to Liverpool and back. The vessel arrived in Belfast on the return trip on Sunday evening the 31st, and is at present receiving the necessary finishing touches prior to taking up her station on the Canadian service. This trial trip was a preliminary one taken with a view to ascertaining the merits of the combination of turbine and reciprocating machinery. It was afterwards reported in more than one journal that the result was so satisfactory that the White Star Company had definitely decided to adopt this system of propulsion in the two leviathans for the same line, whose construction was recently started upon at the Queen's Island. But it was subsequently stated that the White Star Company, while it confirmed the reported success of the run to and from Liverpool, denied the statement that any decisive conclusion had been come to in regard to the method of propulsion to be adopted in the case of the *Olympic* and her sister-ship the *Titanic*. The question of economy will, of course, be taken seriously into consideration, and there is little doubt that this system will show a considerable saving in coal consumption over a complete turbine installation of equal horse-power.

Messrs. Workman, Clark & Co. have launched one vessel since the New Year—the fruit steamer *Abangarez* for the Tropical Fruit Steamship Co., Ltd. Full particulars of this handsomely-modelled vessel appeared in the last issue of the Marine Engineer. The first of the two Orient liners which they have in hand will, within a few weeks, be ready for putting in the water.

Repair Work.—This branch of the trade has been somewhat brisker of late. Messrs. Workman have two large steamers in hand for extensive repairs—the *Glenarm Head* and the *Katherine Park*, while they have just completed a thorough overhaul of the Irish lightship *Seagull*, which is stationed on the Wexford coast. Messrs. McColl & Co. have the steamers *Latchford*, *Helen* and *Parkmore* undergoing hull and machinery repairs. In addition to other work the first-named is being fitted with a new condenser.

Harbour Developments.—The most important item in the Harbour Commissioners' programme of proposed improvements is the widening and deepening of the channel which extends from the Twin Islands to the lighthouse, situated half-way down the Lough, and forms the entrance to the port. The present width is 300 ft. and the depth 32 ft., and it is proposed to double the width and increase the depth by at least 3 feet. This will be a costly undertaking, but in view of the gigantic proportions of the vessels to be built in Belfast the expenditure will have to be faced.

Engineers' Association.—The annual dinner of the Belfast Association of Engineers was held in Ye Old Castle Restaurant on Saturday evening, 13th February, the president, Mr. R. M. Chambers, M.I.M.E., being in the chair. After an excellent repast the usual toasts were given and responded to, and an enjoyable musical programme was provided by a number of well-known local vocalists.

NORTH-WEST OF ENGLAND.

(*From our Own Correspondent.*)

The Outlook.—The outlook has to some extent changed for the better, for the Spanish order has been admitted and it will not be long before things begin to assume a more definite shape. Apart from that there is nothing to report in the shape of any big order. I am given to understand that several big contracts are in the market, but it may be some time before anything comes out, and even then they may not come to Barrow. An order for a floating dock not of very large dimensions has been booked, and there are orders for two others which are likely to come to Barrow. This is a branch which Vickers' seem to be able to do something in, for of late several floating docks have been built, mostly of the Clark and Stansfield's pattern, and the firm appears to be able to give a price which is low enough to bring to Barrow the orders. Soon the British Admiralty will be requiring tenders for the ships in the coming programme, and as there are five, if not six, battleships required, this district may benefit to the extent of one and may be successful in obtaining orders for the machinery of another.

The Spanish Order.—For several months I have written in these notes that the work in connection with the Spanish vessels would come to the Vickers' combine. It is an assured thing now. Denials were floating about to the last minute and the reason for the great secrecy is more than remarkable. The Minister of Marine steadfastly denied all reports to the very last, and when the news did come out it was forced owing to the circumstantial reports which were published in English papers. One matter worthy of notice is the fact that the designs of Armstrong, Whitworth's were most successful, and it will be from these that the vessels will be built. The question now is what will be the extent of work that will be done in this country. The guns, mountings and armour will certainly be built in this country, but it is doubtful if the machinery will. This is not quite settled yet, and it may be that the boilers will be built in Spain, but the engines in this country, and if that is so, then Brown's and Vickers' will probably share them. It will be a good thing when the work is got in hand, but some time will have to elapse, owing to the fact that the new shipbuilding yard will have to be built at Ferrol. This place is very suitable for a shipyard. It is on the Atlantic coast and the harbour is a deep water one and well sheltered. The well-known contractors, Sir John Jackson & Co., have the contract for the building of

the yard, and it will take some two years to actually complete. The question is, will there be any shipbuilding in England in the meantime? It hardly looks like it, for the contract for the building of the ships extends over eight years. The amount of the contract is said to be £8,000,000. It will mean a number of men going out from this country to take the responsible positions, and the name of Mr. J. Campbell, the present shipyard manager of Vickers' at Barrow, is mentioned as the manager for the Spanish yard, while Mr. Peter Muir, late of Swan Hunter's, on the Tyne, is mentioned as the assistant. The work at present is confined to the designing and drawing offices, and I understand it will be May before anything begins to take shape. It will be this at the earliest.

The "Vanguard."—The seventh "Dreadnought," the *Vanguard*, was launched from Vickers' yard on the 22nd of last month. Her keel was laid on April 2nd last year, and her launching weight would be about 10,000 tons. Since last April not a moment has been lost and the way some of the armour has been fixed has been remarkable. In less than thirty days they put on over 900 tons. Of course, no time can be afforded to be lost in the construction of this huge vessel. She has to be complete within two years of the date of the official order, which was early in the month of March, and that means that she will have to be ready to take trials at the end of this year. There will first be speed trials and then gun trials, and it will thus be seen that every hour is valuable. The machinery is well advanced and will soon be fixed in the ship. This is where Vickers' will discover the great advantage of having an up-to-date fitting-out wharf. The *Vanguard* will be the first vessel launched from Vickers' which will fit out at the new wharf. It lies on the other side of the High Level bridge, and there are 100 ft. wide passageways to it from the channel and the Ramsden Dock. On this wharf is one of the latest type of electric cantilever cranes of 150-ton lifting capacity, and this will be able to place everything aboard in a minimum of time and at a minimum of cost. Bigger weights can also be handled. On this wharf have been fitted very handy electric capstans for moving vessels, there is a large store shed and large water and compressed air pipes have been laid from the respective power houses. Cables for the crane, lighting and power have also been laid down and all the above run in one roomy conduit. There is railway communication with the main yard and also direct with the main line. The large crane has not passed its final tests, but has held 87 tons and has also been engaged in dismantling the old *Dreadnought*, which is being broken up. The crane has removed all its armour and the four muzzle-loading guns, which each weighed 35 tons, and up to the present it has given every satisfaction. The motors on the crane are Vickers', and are giving excellent results. It is rather fitting that while the old *Dreadnought* is being broken up the new vessel should come to the same wharf to complete its fitting out.

The Floating Crane.—This crane, which is for Montreal and which it will be remembered had such an experience in the Atlantic, nearly being lost, is now under the big crane, and it is understood that before it leaves it will be fitted up and tested. It is built to lift up to 75 tons. As soon as this is completed and the ice is clear from Montreal, there will be another attempt to take her across the Atlantic.

The "San Paulo."—This is the next battleship to be launched from Messrs. Vickers' yard, and the date is said to be the 20th of March. She could be launched the same day as the *Vanguard*, but it is hardly necessary, for she is not wanted in a great hurry. It is now said that Russia will be the purchaser of this vessel and the one completing at Elswick.

Submarines.—Very quietly the construction of submarines proceeds. They are being turned out engined and got ready for delivery with very little fuss, and they excite but little attention in Barrow now. According to one writer the amount set aside in the past programme for these craft totalled half a million. Messrs. Vickers would get the lion's share of this, for although several of this craft are being built at Chatham the machinery is being supplied from Barrow and, of course, the royalties will have to be paid to Messrs. Vickers for the many patents. It is expected that the new submarine attendant ship, the *Vulcan*, will soon be at Barrow in order to take away two or more of these vessels. There will be several to follow these, for they are still being built. The total number is getting above fifty now. In the later ones there are many improvements to both machinery and hull, but all details are secret and kept so at the request of both the Admiralty and Messrs. Vickers. Judging by the number that have been built, the Admiralty must be pretty certain of the capabilities of these vessels. It is a good thing for Barrow, anyhow.

Dredging Operations.—The Furness Railway Co. and the dock authorities have spent some thousand pounds in dredging a new deep channel to the new fitting-out wharf and also in front of the launching ways from which the *Vanguard* took her leave the other day. Barrow is very fortunate in the possession of splendid launching space. There is both width and depth and consequently it is not necessary to put very heavy checks on the vessels. Further than this, Barrow can boast of several very powerful tugs. The latest was built by Messrs. Vickers themselves for the Furness Railway and is very powerful. Then again, the ground on which the vessels are built is of a very solid nature. It requires very little if any piling to strengthen it, and vessels of any length can be built and launched into the channel. When the two Cunard monsters were in the market Barrow fancied an order for one, and preparations were then made for special accommodation. Unfortunately this land has remained unused up to the present, but there may be a time come when Messrs. Vickers are better able to secure orders for big passenger steamers and then the preparations that they made some years ago will prove useful. The extent of launching ground that Messrs. Vickers now possess is very great.

The Ice-Breaker.—Work is proceeding satisfactorily with the Canadian ice-breaker, but the date of launching has not been fixed. This vessel is to be named the *Earl Grey*, and will have a speed of over 16 knots. She is twin-screw and has a very wide beam for her length. The previous ice-breaker built for the Canadian Government was a smaller vessel and was called the *Lady Grey*. This vessel has given every satisfaction, and this probably had something to do with the second order coming here.

The "Transporter."—That remarkable steamer the *Transporter*, which left Barrow some time ago with a cargo consisting of two complete submarines for Japan, has been successfully submerged in Japan and had her cargo floated out. She has been refitted and is now on her way to Barrow. She will come in very handy for the conveyance of machinery, etc., to the new Spanish port or any other place where Messrs. Vickers may be delivering material to, and it is not impossible that she will be used again to convey submarines to distant ports. This steamer will prove handy in any trade. Her construction is such that she can carry anything, from coal to submarines, barbettes or large guns.

Hæmatites.—As I write there has been a slight improvement in the hæmatite iron trade, and prices have lifted 6d. per ton. Up to that, matters were very slow indeed, and warrant iron is quoted as low as 56/3 per ton net cash. It is now at 57/1½ per ton and firmer. Makers are asking about 58/3 per ton net f.o.b. The steel trade is still very dull and the distress in the district owing to the Barrow works being closed—it is nearing fifty weeks now—is very great. The Mayor of Barrow, Mr. T. F. Butler, who is interested in the iron trade considerably, has approached the Barrow Steel Co., but they cannot hold out any hopes for the next two months yet.

Shipping.—There is a slight improvement in shipping and the amount of iron and steel exported during the month has been better until the decrease, which this year's aggregate showed, compared with the same period of 1908, has almost been wiped out. One or two vessels which have been lying up have sailed. The importation of ore is still low.

MERSEY AND MANCHESTER SHIP CANAL.

(From our Own Correspondent).

Once more the outlook is showing signs of brightening considerably, and one is bound to take a more optimistic view of the engineering and shipbuilding prospects.

Repair Work.—Messrs. H. & C. Grayson continue to be fully occupied with many varied and important contracts, including an interesting welding job on the Anglo-American Oil Co.'s steamer *Delaware*, by the new Oxy-Acetylene

Welding Process. The work consisted of the filling in of wasted landing edges of some of her furnaces, and welding up several cracks. A very successful demonstration of this process was given last month at the works of Messrs. E. H. Williamson & Co., Ltd., by the British Autogenous Welding Co., Ltd., under the auspices of their Liverpool agent, Mr. Chris. Geddes, in the presence of a large and representative gathering of engineers. They are also carrying out considerable repairs to the ss. *Osprey*, and it is understood that they have secured a very important contract for repairs to a Manchester steamer. The repairs to the Dominion Liner *Corinthian* have now been completed, and Messrs. Grayson have finished an extensive repair and general overhaul to the ss. *Stag* of the Stag Line.

Messrs. Cammell, Laird & Co., Ltd.—The revival of trade is being very much felt by this firm, whose repairing department is very busy with a large number of jobs. Their splendid facilities for dealing with turbine engines has again been proved by their securing the contract for repairs to the Great Western Railway Co.'s steamer *St. George*, which will be undergoing an extensive overhaul at their yard. Amongst other important repairs they have in hand may be mentioned the oil tank steamer *Potomac*, and two of Messrs. Japp and Kirby's steamers *Cara* and *Barra*. They have also received a considerable number of enquiries for new steamers, and it is understood that several important contracts are now pending settlement. Amongst these it is believed are Admiralty jobs and other vessels varying in size from one or two large vessels of over 400 feet in length, to several small steamers for river and coastal service abroad.

Dock Board Dredger.—The new dredger *Leviathan*, the largest in the world—capable of dealing with over 10,000 tons of sand per hour—has now been completed by Messrs. Cammell, Laird & Co., Ltd., and is undergoing very exhaustive trials and tests, but up to time of going to press the official results are not available.

Acetylene Buoys in the Crosby Channel.—Ever keeping to the front the Mersey Docks and Harbour Board have been the first in this country to make use of the system of Automatic Acetylene Lighting for Buoys. About eight months ago they replaced an oil-gas buoy (known as the "Rip-Rap," outside New Brighton) with an Acetylene Buoy supplied by the International Marine Signal Co., of New York and London, and have now thoroughly tested the efficiency and superiority of this system over the old compressed oil-gas light. During the six months' trial, no attention at all was given to the buoy, and at the end of this time, the burners were found to be as clean as when they were first started, and mariners and pilots using the port have expressed general satisfaction with this improvement. The flashing has worked perfectly in all weathers, and the extreme penetrating power of the light has been greatly appreciated by captains, especially during foggy weather. As compared with oil-gas buoys, which have a candle power of about 26, the "Rip-Rap" buoy now has a candle power of about 340, so that even the smallest light which the International Marine Co. make, *viz.*, 140 c. p., can easily replace two of the oil-gas buoys, to say nothing of the minimum of attention required for their upkeep. The oil-gas buoys require attention every few weeks, whereas twice a year is all that is necessary with the Acetylene System. It is very probable that in the near future the Dock Board will adopt the acetylene light throughout the Crosby Channel.

It is rumoured that Messrs. Wm. Johnston & Co. are in the market for three or four new steamers, which will probably be built on the north-east coast, but no definite information is yet available.

White Star Line and Canada.—The Allan Line have entered a protest against the proposed establishment of a Canadian Passenger Service by the White Star Line, which latter firm, though not breaking the terms of the Canadian Passenger Conference, *viz.*, that they do not increase their nominal sailings for the purpose of having a Canadian passenger service, have, the Allan Line contend, been actually doing this by sailing under the Dominion Line flag.

"Bengar."—The Liverpool Salvage Association are progressing satisfactorily with the salvage of this steamer, which is wrecked at Garston, but the strong tides are still hindering the work considerably.

Death of a Northwich Shipbuilder.—The death is unfortunately recorded of Mr. Isaac Pimblott, senior partner of Messrs. Isaac Pimblott & Sons, of Northwich. The deceased gentleman commenced work at a very early age. At the age of nineteen he came to Liverpool. After working for about two years in various shipyards here, he returned to his native town to commence business on his own account. He managed the Weaver Shipyard with considerable success, and on taking his three sons into partnership, removed to more commodious premises on the banks of the Weaver. A source of great pleasure to him was that he built the first steamer to sail across the Atlantic to South America. Mr. Pimblott was a keen business man, and possessed a large amount of energy and ability.

THAMES.

(*From our Own Correspondent.*)

New Liners for the Thames.—The arrival of the *Malwa* at Tilbury was signalized by the P. & O. Co. with an inaugural lunch, at which 300 guests were present at the chairman's (Sir Thos. Sutherland) invitation. After the repast the guests were asked to inspect the new boat, which is a twin-screw of 11,500 tons and 15,000 h.p., and many improvements were noted tending to the comfort of the passengers. The *Osterley*, one of the new Orient boats, at her launch on the Clyde, was stopped on the ways by the freezing of the tallow used. Every expedient was tried without avail, but the boat being successfully fastened was got away on a later day. The hitch preventing her catching the tide at the time intended.

Rescuers at Messina.—One of the vessels to do service at Messina was the *Drake*, belonging to the General Steam Navigation Co., and on her return to the Thames at Fresh Wharf, London Bridge, the Lord Mayor and Lady Mayoress and several directors of the company assembled on board to congralutate Captain Carter and the crew who did such service. The visit was made one of ceremony, and the crew in their best were drawn up to receive the visitors and be thanked. The record of this vessel was 308 persons saved.

Port of London.—March 31st has been definitely selected as the day for the transfer of the London and India Dock undertakings to the new Port of London authority, so it is announced.

New Thames Embankment.—In about two years the New County Hall and a fine embankment will occupy the site next to Westminster Bridge, on the south side, which is now a waste ground with a background of wharves and warehouses. At present eighty men are employed on the preliminary work. Two pile drivers are at work already and a third will soon be, the immediate end being the construction of a dam to enclose the site of the embankment wall. The contract requires that the new embankment is to be complete in eighteen months, after which the County Hall will be erected.

SOUTHAMPTON.

(*From our Own Correspondent.*)

Messrs. Day, Summers & Co., Ltd., Northam.—Mr. Alfred Farquhar's yacht *Medusa* (630 tons) was slipped and painted, and left on the 16th of last month for a Mediterranean cruise.

The Isle of Wight Co.'s ss. *Princess Beatrice* has had a new funnel fitted, and the same Co.'s *Prince Eddie* has gone through her survey, also the tugboat *Alert* was put through survey. The 220-ton steam yacht for Col. Gascoigne is now being plated and the engines and boilers are well advanced. Good progress is also being made with the joinery work. Work is also proceeding on the new slipways, orders for three having been secured at the beginning of the year.

Messrs. J. I. Thornycroft & Co., Ltd.—H.M. first-class T.B. No. 31. This vessel completed the whole of her trials and was inspected by the Admiral-Superintendent on the 9th of last month, and handed over on the following day to the Portsmouth Division, being delivered considerably earlier than the date provided by contract. H.M. first-class T.B. No. 32. This vessel has successfully passed her various trials and arrangements are being concluded for inspection and

delivery. H.M. T.B.D. *Nubian.* Work is in full progress on this vessel. The ss. *Paso-de-Cuevas.* This vessel did not leave here until Saturday, the 6th February, and was compelled to put into Falmouth by stress of weather. She is the third of the five vessels building for Argentina to sail for their destination. Ss. *Paso-de-Martin Garcia.* This vessel is now rapidly completing and will shortly sail for Argentina. Ss. *Paso-de-San Lorenzo.* This vessel was launched about the middle of last month and is now having boiler and machinery fitted at the jetty. Tug boat and flat for Chinese rivers. These vessels are now dismantled having been painted and marked preparatory to shipment. H.M. T.B.D. *Savage.* This vessel's keel is now laid and work is steadily progressing Steam yacht for Budapest. This yacht's framing is now completed, also the yacht for Lord Leith has all keel moulds in position.

According to the latest advices from Cartagena the R.M.S.P. Co.'s steamer *Trent* (5,525 tons) seems likely to become a total loss. The *Trent* was engaged on the Co.'s West Indies and New York route. A portion of the crew arrived in this port aboard the Co.'s sister vessel, the *Tagus,* on the 8th February last. The vessel struck a coral reef about fourteen miles off Cartagena on the 6th January last and salvage operations have been vigorously carried on, but so far without success.

THE TEES AND HARTLEPOOLS.

(From our Own Correspondent.)

Middlesbrough.—There is little, if any, improvement in shipbuilding at Middlesbrough, with the exception of a large passenger boat now nearing completion at Sir Raylton Dixon & Co.'s yard.

Stockton.—At Stockton things are even worse than Middlesbrough, and the prospects for some time to come are distinctly bad. There is a rumour that a certain firm on the Tees is in very straightened circumstances, illustrating the times shipbuilders are passing through.

The new graving dock and works at South Bank, which Messrs. Smith, of North Shields, are building, is just about completed, having given work to a great number of men for some considerable time past. They will now be in a position shortly to book orders, and it is reported have several small craft on the way at the present time. All future new work will be done here.

The Hartlepools.—At the Hartlepools shipyards there is perhaps a little more work in hand than a month ago, but certainly not sufficient to justify one in saying they are busy. There are six ships on the ways to the order of Sir Christopher Furness, two of these are being built at the new Co-Partnery yard, Middleton, two at Irvine's dockyard and the others at Messrs. Gray & Co. The orders for the engines were also secured by local engineering firms, Messrs. Richardson, Westgarth & Co., getting four, the other two being supplied by the Central Marine Engine Works of Messrs. W. Gray & Co. At Messrs. Gray's old yard work is practically at a standstill. They have just finished the little work they had in hand and at the present time all the berths are empty. At their new yard a more active appearance presents itself, though they are by no means busy, having little on the ways except the two vessels already mentioned.

Irvine's dockyard have been kept fairly well employed for some time, and in addition to the orders placed by Sir Christopher Furness, they have some repair and alteration work in hand. The ss. *Oporto* is docked there, which has to be lengthened 30 ft., thereby demonstrating the fact that to get a more economical speed it is necessary to have a lengthy ship. The ss. *Teessider,* for the Tyne and Tees Steamship Co., was launched on the 22nd February.

At the late Furness Withy's yard, where the new Co-Partnery scheme is being carried on under the style of Irvine's Shipbuilding and Dry Dock Co., Ltd., and which for some months past has been practically empty, things are beginning to look brighter, though it will be some time before they get thoroughly going. They have two or three new vessels on the ways and, it is reported, have lately secured more orders. They have also an old vessel in to be stripped of all internal woodwork and refitted throughout.

Messrs. Richardson, Westgarth & Co. have work that will keep them occupied for same months, though there are not many new enquiries, the last two contracts being for Messrs. Elder, Dempster & Co., There has been much depression in the Hartlepools for a considerable time past, throwing out of employment some hundreds of men. It was welcome news, therefore, when it became known two or three weeks ago that the steel works at West Hartlepool were restarting about 200 men, and now it is announced that the forge of the South Durham Steel and Iron Co. is to be restarted, and will probably afford employment for an additional number of men.

An event of more than local interest took place at West Hartlepool recently, when the freedom of the borough was presented to Sir Christopher Furness, M.P., the Pilot of Co-Partnery and the first native of the borough to be thus honoured. Sir Christopher has been actively connected with the shipbuilding industry of this port for some thirty years, and, as is well known, has recently drawn up a scheme by which it is expected to avoid disputes with the men in the future. It will be remembered that it was only after many meetings with the men's representatives that it was agreed to give the scheme a trial for twelve months, commencing 1st April. There are some people who are doubtful as to the amicable working of the scheme, but Sir Christopher is confident that it will prove workable. It is to be hoped he is right and that it will be the dawn of brighter and more prosperous times for the Hartlepools.

Sir Christopher is also to be presented with the freedom of the Hartlepool borough, which should have taken place on the 28th of February. The borough member finds, however, that this date is inconvenient and will arrange later as to when he can be present to receive the honour.

The illustration of the launching of the ss. *Patris,* in our February issue, was reproduced from a photograph supplied by Messrs. Frank & Sons, of South Shields.

Institute of Marine Engineers.—At the Institute of Marine Engineers on Friday, February 12th, a very pleasant Bohemian concert was held on the invitation of Mr. and Mrs. N. K. MacLean. Mr. Jas. Adamson (hon. secretary) presided over a very large attendance of members and friends. Miss A.C. Robertson, who acted as accompanist throughout the evening, opened the first part of the programme with a very well-rendered pianoforte selection, "Air de Ballet," by Cheminade. Mrs. B. Wood followed with a solo, "A man's a man for a' that," sung with a spirit in harmony with the sentiment. Mr. P. Taylor supplied the humorous element with a song, "Shift a little bit further," which called forth the encore "Outside." Miss E. E. Mounter contributed a great deal to the pleasure of the audience with her excellent rendering of "Bring back the sunshine," as did also Mr. John Grimes, whose splendid recital of the humorous piece "In an oven with Jerrybin" was very well received. The first part of the programme was brought to a close with the song "Bid me to love," sung very effectively by Mr. John Mounter. After the interval, during which refreshments were handed round, Miss Robertson again opened with the pianoforte solo "Ye banks and braes." Hearty appreciation was afterwards shown of a recitation by Miss K. Bugg, entitled "The adventures of Aunt Abigail," the pleasure of the audience being further enhanced by the items which followed, including a duet by Mr. and Miss Mounter, "When the wind blows in from the sea," humorous song by Mr. Taylor, "Oh! the business," and encore; song, "Flight of ages," by Mrs. B. Wood; song, "The bell at sea," by Mr. John Mounter; recital by Mr. Grimes, "Jud Brown's description of Rubenstein's pianoforte playing," and on being recalled "A temperance lecture." The last item of an excellent programme was a song from Miss Mounter, "Oh, that summer smiled for aye." A hearty vote of thanks was accorded to Mr. and Mrs. MacLean for their kindness in providing so enjoyable an evening, and the Chairman afterwards commented upon the successful nature of these gatherings, the inauguration of which was largely due to the efforts of the late Mr. H. Bertram.

LAUNCHES AND TRIAL TRIPS.

LAUNCHES—English.

Claudius.—On February 6th, there was launched from the shipyard of Messrs. Cochrane & Sons, shipbuilders, Selby, a handsomely modelled steel screw trawler, the principal dimensions being 136 ft. 8 in. by 23 ft. by 13 ft. moulded. The vessel has been built to the order of Messrs. The Consolidated Steam Fishing and Ice Co. (Grimsby) Ltd., of Grimsby, and will be fitted with powerful triple-expansion engines by Messrs. Amos & Smith, of Hull, and is replete with all the latest improvements for fishing purposes. As the vessel left the ways she was gracefully christened the *Claudius* by Miss Marsden, of Grimsby, after which the company adjourned to the builders' offices, where breakfast was served and the customary toasts given and responded to.

Nonio.—On February the 9th, there was launched from the shipbuilding yard of Mr. William Walker, at Maryport, a steel screw barge of the following dimensions:—Length between perpendiculars, 80 ft.; breadth moulded, 18 ft. 6 in.; depth moulded, 8 ft. 6 in. She will be fitted with compound surface-condensing engines built by Messrs. Gauldie, Gillespie and Co., Glasgow, having cylinders 11 in. and 22 in. by 16 in. stroke, boiler 8 ft. 6 in. long by 8 ft. 6 in. diameter by 130 lbs. w.p. The vessel has been built to the order of the Bishop's Wharf Carrying Co., Warrington. She was designed and constructed under the superintendence of Messrs. William Esplen & Sons, Liverpool. The vessel was named *Nonio* by Miss Amy Jones, the daughter of the manager of the company.

Espadarte.—On January 23rd, Messrs. Hepple & Co., Ltd., of South Shields, launched a powerful steel screw tug *Espadarte* to the order of Messrs. James Pollock, Sons & Co., Ltd., 3, Lloyd's Avenue, London, the well-known tug specialists. The special features of this vessel include a turtle back, forward deck saloon, Pollock's patent stern frame—which gives greater towing efficiency—vertical steam windlass forward, etc.

Thurso.—On February 5th, Messrs. William Dobson & Co. launched from their shipbuilding yard at Walker a steel screw steamer which they have built to the order of Messrs. Thomas Wilson Sons & Co., of Hull, for their regular trade between Hull and the Baltic. The vessel, which is built to the highest class of the British Corporation, is of the quarter-deck type of the following dimensions:—Length between perpendiculars, 250 ft.; breadth, 34 ft.; depth moulded, 18 ft. Special attention has been given to the rapid loading and discharging of cargo and to the carriage of large deck loads of agricultural machinery. The engines and boilers, which are being constructed by Messrs. Amos & Smith, of Hull, consist of a set of triple-expansion engines, having cylinders 16½ in. by 27 in. by 45 in. diameter by 33 in. stroke, with two single-ended boilers working at 180 lbs. pressure. Before leaving the ways the vessel was christened *Thurso* by Miss Frances G. Tarn, of Hull.

Legia.—On January 25th, Messrs. Short Brothers, Ltd., launched from their shipbuilding establishment at Pallion, Sunderland, the ss. *Legia*, built to the order of Messrs. T. Nolson & Sons, for the Ghent Lloyd, of Ghent. The vessel, which will take the highest class at Germanischer Lloyd, is:—292 ft. in length, 41 ft. beam, and 20 ft. 7½ in. depth moulded, and will carry a cargo of 3,600 tons on a moderate draught of water. She is constructed on the deep frame principle, with one deck laid, long poop, and topgallant forecastle. Water ballast is provided for throughout the double bottom, and in both fore and after peaks. Comfortable accommodation is provided for the captain, with saloon handsomely panelled in polished hardwood, and for the officers and engineers in houses on the bridge deck, the crew being berthed in forecastle. Five steam winches, steam windlass, steam-steering gear amidships, with rods and chains to quadrant and controlled from standards on upper and lower flying bridges, are fitted, all driven from a large donkey boiler in stokehold, hand-steering gear aft fitted. The propelling machinery is by the North-Eastern Marine Engineering Co., Ltd., Sunderland, and consists of engines with cylinders 21 in. by 33 in. by 55 in. diameter and a stroke of 36 in. driven by two multitubular boilers working at 180 lbs. pressure. During construction the hull and machinery have been under the supervision of Mr. P. J. Goetbloet, of Antwerp.

Dearne.—On February 10th, a steamer for the Lancashire and Yorkshire Railway Co. was launched by Messrs. Swan, Hunter & Wigham Richardson, Ltd., from their Neptune shipyard, Newcastle-on-Tyne. The steamer, which was named *Dearne*, is 240 ft. in length by 34 ft. beam by 16 ft. 4 in. depth, and is being constructed to attain the highest class in Lloyd's register. The propelling machinery is also being constructed by Messrs. Swan, Hunter & Wigham Richardson, Ltd., and consists of a set of triple-expansion engines supplied with steam by two boilers. It is anticipated that this machinery will propel the vessel at a speed of 13 knots on the voyage between England and the Continent. The vessel is fitted with accommodation for a limited number of passengers, together with stalls for horses and cattle. The owners were represented at the launch by Commander W.S. Atkin, R.N.R., of Goole, their marine superintendent on the east coast, and the naming ceremony was gracefully performed by Mrs. Atkin.

LAUNCHES—Scotch.

Oder.—On February 8th, Messrs. Ramage & Ferguson, Ltd., Leith, launched a steel screw cargo steamer, which they have built to the order of the Leith, Hull and Hamburg Steam Packet Co., Ltd., of which Messrs. James Currie & Co., Leith, are the managers. This vessel has been built for Baltic and general trade of the company and will carry about 1,175 tons deadweight on Lloyd's winter load-line. The steamer is fitted with all modern appliances for rapid handling of cargo and has a complete electric light installation. The machinery, which is made by the builders, consists of a set of triple-expansion engines with cylinders 16½ in. by 27 in. and 44 in. diameter by 30 in. stroke, supplied with steam from two boilers working at 180 lbs. pressure. On leaving the ways the vessel was named *Oder* by Miss Elspeth Currie, Larkfield, Trinity.

Osterley.—On January 26th, there was launched from The London and Glasgow Shipbuilding and Engineering Co.'s yard, at Govan, the fine 12,000 ton twin-screw steamer *Osterley*, built to the order of the Orient Co. The *Osterley* is the third of the five liners which the Orient Co. are having built for the Australian mail service. The launch was to have taken place on the 21st January, but the vessel, after moving down the ways about forty feet, stopped, and, as the tide was beginning to go back, it was considered advisable to stop all attempts to float her and to make her fast on the berth. The explanation of the unfortunate hitch in the launching of the vessel was that the frosts of several previous evenings had affected the grease between the ways to such an extent that it had lost its lubricating properties. When the Countess of Jersey, who named and released the ship, cut the cord the big liner began to move in a quite satisfactory manner. Instead, however, of increasing in speed, she gradually slowed down, until some distance before the sliding ways had got over the camber on the standing ways, she had practically stopped. The shipyard staff had been working energetically under the direction of Mr. J. W. Shepherd, the managing director, to accelerate the speed of the ship down the ways, but she moved only thirty-three feet in a little over an hour, and although some motion was still perceptible on close watching, it was decided that it would be dangerous to allow her to proceed any further, and at the slow rate she was travelling she would have lost the tide. The carpenters were, therefore, set to work to fix the sliding ways to the standing ways, and so to block up the vessel that there would be no danger of her slipping off unexpectedly.

TRIAL TRIPS.

Beothic.—On January 28th, the steamer *Beothic*, which has been built by Messrs. David and William Henderson and Co., Ltd., Partick, Glasgow, went down the river and ran a series of speed trials, attaining a mean speed of over 13½ knots. This vessel has been built to the order of Messrs. Job Brothers, of Liverpool and St. John's, Newfoundland, and is intended for the seal fishing industry, and is, therefore, of exceptional strength for forcing her way through the ice, and is also replete with everything that can add to the economical working of

cargo. The principal dimensions of the vessel are :—Length between perpendiculars, 240 ft. ; breadth moulded, 35 ft. 6 in. ; depth moulded, 19 ft. ; with a gross tonnage of about 1,150 tons ; is classed 100A1 in Lloyd's Registry and has accommodation in houses on bridge deck for a limited number of passengers. The machinery, which has also been constructed by Messrs. Henderson, consists of triple-expansion engines having cylinders 22 in., 36 in. and 59 in. diameter by 39 in. stroke, two single-ended boilers having a working pressure of 180 lbs. During the trials the owners were represented by Messrs. William, Samuel & Thomas Job and their Consulting Engineer, Mr. George Hepburn, Liverpool, assisted by their Superintendent Engineer, Mr. W. S. Crossman. Throughout the day the machinery ran without a hitch and the owners expressed their entire satisfaction.

Princesse Clementine.—The fine new steel screw steamer *Princesse Clementine*, built by Messrs. The Tyne Iron Shipbuilding Co., Ltd., of Willington Quay-on-Tyne, to the order of Messrs. "Ocean" Société Anonyme Belge d'Armement & de Navegation—Messrs. Leon Dens & Co., managers—of Antwerp, recently left the Tyne for her official trial. This vessel is 310 ft. long, 42 ft. beam, with depth moulded of 21 ft. 3 in. and has been built to class 100A1 at Lloyd's under shelter-deck type, and has water ballast fitted right fore and aft on the cellular system, and is also fitted with all modern improvements for the rapid loading and discharging of cargo. The propelling machinery, which has been constructed and fitted at the Northumberland Engine Works of Messrs. The North-Eastern Marine Engineering Co., Ltd., Wallsend-on-Tyne, consists of a set of their latest type of triple-expansion engines, having cylinders 22 in., 37 in. and 61 in. by 42 in. stroke, steam being supplied by three large steel boilers, working at a pressure of 180 lbs. per square inch. During the trial runs very bad weather was encountered, but, despite this, a speed of well over the guaranteed rate was maintained and the machinery gave satisfaction to all concerned. Amongst those on the run were Mr. Dens, Managing Owner, Mr. J. M. Burnlee, under whose supervision both hull and machinery have been constructed, Mr. G. F. Mulherion and Mr. J. Bourn, representing the shipbuilders, and Mr. D. Myles representing the engine builders.

Rouen.—On February 1st, the handsome steel screw steamer *Rouen*, recently launched by Irvine's Shipbuilding and Dry Docks Co., Ltd., at their Harbour Dockyard, and built to the order of Messrs. Furness, Withy & Co., Ltd., West Hartlepool, proceeded to sea on her trial trip. This vessel is one of the most up-to-date and one of the largest self-trimming colliers afloat, having extremely large hatchways and equipment for rapid loading and discharging, and is fitted with a complete installation of electric light, having large clusters at each hatch. The dimensions of the vessel are as follows : 290 ft. by 40 ft. 2 in. by 20 ft. 6½ in., and is fitted with poop, bridge and topgallant forecastle. She is built to the highest class in British Corporation Registry. A cellular double bottom is fitted throughout with extra large after-peak tank, thereby considerably immersing the propeller and thus enabling the vessel to make passages in ballast condition without reducing her steaming qualities. The pumping arrangements have been so carried out that the whole of the water ballast can be pumped out in 2½ hours, which enables the vessel to make the port in a full ballast condition, whilst at the same time she is able to commence loading immediately. She is constructed with bulb-angle frames and longitudinal stringers and is subdivided to give four clear holds. A powerful quick-warping steam windlass is fitted amidships with hand-screw gear aft. Accommodation for the captain and officers is arranged in the poop, engineers in houses amidships, crew and firemen in forecastle. The cabins throughout are heated with steam and the sanitary, ventilating and lighting arrangements have been effected on the most approved lines. Triple-expansion engines have been supplied and fitted by Messrs. MacColl & Pollock, Sunderland, having cylinders 20½ in., 33 in., 54 in. by 36 in. stroke, two large single-ended boilers 180 lbs. pressure, and a Cochran (Annan) donkey boiler with patent seamless furnace has been fitted. During a very satisfactory trial it was ascertained that the vessel had maintained a mean speed of 10 knots.

Ocean Queen.—On February 10th, the handsome steel screw steamer *Ocean Queen*, built by Messrs. William Gray and Co., Ltd., West Hartlepool, was taken on her trial trip. The vessel has been built to the order of Mr. Jacob Christensen, of Bergen. She has a Board of Trade passenger certificate, and takes the highest class in Lloyd's. Her dimensions are :—Length over all, 356 ft. ; breadth, 43 ft 6 in. ; and depth, 26 ft. 1 in. She is a flush deck vessel, with topgallant forecastle, clipper stem, and short bowsprit, and is schooner-rigged with two masts. There is a handsome dining saloon in house on the promenade deck, with large skylight, sideboard, piano, etc. There is also accommodation for a large number of first and second-class passengers in houses on the spar deck, for the officers and engineers in houses alongside the casing, and for the crew aft in a large house and in 'tween decks. There is a very efficient installation of electric lighting, electric bells, refrigerating machinery, and cold chambers, and the ventilation has received careful attention to suit the tropics. The hull is built with deep bulb angle frames, five water-tight bulkheads, 'tween decks all fore and aft, cellular double bottom and after-peak tank for water ballast. There are large hatchways and eight steam winches, while the masts have derrick tables and outriggers. Steam-steering gear, also hand gear is fitted in the deck house aft, patent direct steam windlass, five lifeboats, motor launch, stockless anchors and large whaler-type winch of special design to lift 45 tons, and a complete outfit is provided for a first-class passenger and cargo steamer. The engines are of the triple-expansion type, manufactured by the Central Marine Engine Works of the builders, and have cylinders 24 in., 38 in. and 64 in. diameter by 42 in. stroke. Steam is generated by two large main boilers and one auxiliary boiler, all adapted for 180 lbs. per square inch. Included in the inventory is a liberal supply of spare gear and outfit. The trial trip was witnessed by Mr. Jacob Christensen, Owner, Capt. Johannessen and Mr. P. Balmsen, who have superintended the construction of the vessel and machinery, the shipbuilders being represented by Captain J. E. Murrell and and the enginebuilders by Mr. Maurice S. Gibb. The trial was a satisfactory one in every respect, an average speed of 12 knots being obtained.

REVIEWS.

The Principles and Practice of Boiler Construction. By W. D. Cruickshank, M.I.Mech.E., late chief engineer and surveyor, New S. Wales Government. Second edition, revised and enlarged. The Australian Book Co., 21, Warwick Lane, E.C.

This book is the second and enlarged edition of that published in 1894, and is written for those who are familiar with steam boiler design, and fills a decided want having regard to the comparatively few standard works on boiler construction, which are sufficiently practical to commend them to mechanical engineers and boiler makers. The original subject matter is contained in a series of papers which were first read before the Engineering Association of New South Wales. The arrangement of the book is well thought out, the matter is lucidly expressed and the formulæ illustrated with examples. It is specially in connection with the last feature that the utility of the book will appeal to those whose education is only of a moderate character, but whose practical experience will enable them to apply the rules as soon as the basis is understood. The work commences with a treatise on the properties of iron and steel, and then in turn cylindrical boilers, cylindrical furnaces, spherical ends, flat surfaces, compressive stress, steam domes, openings in boiler shells, and riveting are dealt with. Separate chapters are reserved for safety valves, steam pipes, feed, heat, draught, etc., and water tube boilers. The chapter on the last subject is not as comprehensive as it might be, many types of interesting designs being omitted. The book has 360 pages in all, only 225 of which are utilized by the subject matter proper, the remainder being taken up for the most by a reprint of the Board of Trade regulations and Lloyd's rules for survey and construction. These surely might well have been omitted and the space utilized for interesting matter not so easily obtainable as the rules referred to. On the whole the book should prove very useful to the boiler designer and the boiler maker.

The Steam Turbine. By James Ambrose Moyer, S.B., A.M., Member of the American Society of Mechanical Engineers, etc. First edition 1908. Chapman & Hall, Ltd., London.

This book is a practical treatise for engineers and designers. The author has contrived within the space of a small volume of 362 pages, to record his practical experience of a considerable number of years in such a way as to form a manual for the practical engineer who is designing, operating or manufacturing steam turbines rather than a compilation of manufacturers' catalogues, combined with a digest of standard books on thermo-dynamics and mechanics. The book commences with an explanation of the elementary theory of heat, and proceeds to deal with nozzle design, steam turbine types and blade design, mechanical losses in turbines, method for correcting steam turbine tests, commercial types of turbines, governing steam turbines, low-pressure exhaust turbines, marine turbines, tests of turbines, steam turbine economics, stresses in wings, drums and discs for turbine wheels, gas turbines and electric generators for turbines. Included with the book as an independent feature is an entropy-total heat chart, laid out with lines of constant super heat instead of lines of constant temperature which is usual with charts of this kind. The utility will be appreciated when it is remembered that guarantees of steam consumption are usually given in this country in degrees of super heat, rather than of temperature.

Steam Boilers. By C. H. Peabody, Professor of Naval Architecture and Marine Engineering, and Edward F. Miller, Professor of Steam Engineering, both of the Massachusetts Institute of Technology. Second edition revised and enlarged. Chapman & Hall, Ltd., London.

This book is written primarily for the use of students in technical schools and colleges, but in many ways it will be found useful to engineers in general. The book deals generally with boilers and with the methods of designing, making, managing and maintaining boilers. The first edition of the book was published in 1897, and in the edition under review a considerable amount of new material and many new illustrations have been added in the second edition. A short chapter on super-heaters has been added, also a number of tables giving the dimensions of and the floor occupied by different types of boilers and by economizers. The illustrations are particularly well executed, and the tables are arranged in such a way as to be easily understood and utilized by the student. A special chapter deals with the subject of boiler testing and the method and apparatus for determining the number of pounds of water pumped into the boiler during the test, the weight of coal burnt, the weight of ashes left, the temperature, the feed water, the pressure of the steam, and the percentage of moisture in the steam. In addition to the above, full information is given in order to determine the conditions of combustion, such as the draught, the weight of air supplied per lb. of coal, the composition of the products of combustion, and the temperature of the escaping flue gases.

The Design and Construction of Ships. (Prof. J. H. Byles). (25s.) London: Chas. Griffin & Co., Ltd. 1908.

The book under review is an excellent work upon the design and construction of ships and is the embodiment of several years' lectures by Professor J. H. Byles, in Glasgow University. It commences with general considerations of the equilibrum of a floating body and goes on to tell the reader as to the methods of determination of the volume and centre of gravity of a known solid. We notice, however, that differential and integral calculus is considered to be known by the readers of the volume. Arithmetical rules for integration are given with their application to the determination of volumes, centres of gravity and moments of inertia. We then come to description and instances of ships' forms, with clear designs and illustrations of different types of vessels. In Part II there are excellent chapters upon metacentres and "trim" with coefficients and standardizing calculations. Some very interesting views are given of instruments used to determine areas, and there are well-written chapters on cargo capacities and tonnage. In Part III the author deals with the strength of ships, including straining action, tensile compressing and shearing stresses. The author then proceeds to deal with the various forces resulting to the structure when amongst waves, and winds up with a description as to a method for determining strains upon the structure.

The Mechanical World Pocket Diary and Year Book for 1909. (6d.) Emmott & Co., Ltd., Manchester.

The 22nd issue of this useful little pocket diary, for the year 1909, has been brought before us. We were able to favourably notice the 1908 edition of the diary in our March issue of last year, and we find that in the present volume several improvements have been effected. The section on steam turbines has been extended and re-written so as to deal more adequately with the developments which call for attention at the present time. It is to be also noted that the section on friction clutches has been made considerably more comprehensive. A section also on chain driving has been introduced and a note on graphic calculation of moments of resistance of beams has been added. The indicator of the steam engine is also well illustrated and diagrams are shown with the proper deductions therefrom. Boilers are well discussed as to their respective merits and the pitch of rivets and other details concerning them are carefully gone into. The chapters on gas engines are well written as to general principles and calculations for brake horse-power.

The Mechanical World Electrical Pocket Book for 1909. (6d.) Emmott & Co., Ltd., Manchester.

This is a companion pocket book to the pocket diary, reviewed above, and is the second edition of the Electrical Pocket Book, which we were able to favourably notice in our March issue of last year. In the present edition we find that there is a very considerable increase in the pages, amounting to nearly 25 per cent. By this enlargement of the book it has been made possible to include fresh matter on electric bells and bell circuits, also on transformation of currents. Some useful notes on motor generators, rotary converters and on alternate current and static transformers are given, whilst useful information on cables, with fuses, circuit breakers, balancers, boosters and electric lifts are not forgotten. Some good points are brought out in flexible shaft couplings, horse power of leather belts and rope driving, whilst paper pinions and worm gearing receive due consideration, these latter not being necessarily electrical notes, but equally effective for those who have to deal with plant driven electrically.

Technical Dictionary in Six Languages Vol. III: Steam Boilers and Engines and Steam Turbines. (16s.) Vol. IV: Internal Combustion Engines. (8s.) Constable and Co., London. 1908.

We have before us two further volumes of this very creditable dictionary, in which the six languages used are German, English, French, Russian, Italian and Spanish. Volume III deals with the subjects of steam boilers and engines and with steam turbines. The volume is divided into sections, having reference in the first place to the generation of steam, and afterwards to its application, and the words are arranged according to the natural sequence of the various phenomena with the different constructional parts arranged in like manner. The section on steam turbines contains only those expressions which refer directly to them, as all general expressions are included in the previous sections. The illustrations between the columns of the technical description given in the six languages are very useful so as to identify the subject matter by visible description. We consider that these illustrations would serve as a mode of education to a person perusing the dictionary. The whole volume, though small, is of clear, distinct type, the drawings also being clear and comprehensive. The latter section on steam turbines, including the theory of the steam turbine, steam turbine parts and turbine plants, is only a small part as compared with the former sections, but has all the necessary information about these parts of the subject.

Volume IV gives details of a branch of engineering which has been enormously developed during the last few years, *viz.*, internal combustion engines. It includes gases and oils, as to their fundamental chemical notions, with a theory of internal combustion engines. The materials used are included, together with their manipulation, whilst all details of the construction and equipment of internal combustion engines are here detailed. The erection and working and testing, are each set out with all necessary words and phrases adaptable to this part of the construction.

BOARD OF TRADE EXAMINATIONS.

November 22nd, 1908, to February 6th, 1909.

ABERDEEN.—*1st-class :* Wm. Fothergill, J. K. W. Matheson. *2nd-class :* E. C. Barrie, P. Crombie, J. Donaldson, A. M'Millan, Alex. Smith.

BARROW.—*1st-class :* Alex. J. Waddell. *2nd-class :* Thos. Thomson.

BELFAST.—*1st-class :* R. Bullock. J. Mc. F. Guy, N. Irvine, H. Lawther. *2nd-class :* G. Elliott, H. E. Hutton, G. Johnson, J. O. Phillips, A. Robertson, R. Stuart, R. M. Wright.

BRISTOL.—*Extra 1st-class :* A. Stone, *1st-class :* J. W. Trevillion. *2nd-class :* F. H. Cullen, W. Spofforth.

CARDIFF.—*Extra 1st-class :* W. H. Colpitts, D. T. Garrett, T. A. Seaward. *1st-class :* W. Black, D. H. Evans, N. Hall, W. H. Phllips, J. J. Plater, W. G. Preece, C. I. Price, J. Walsh, J. M. Evans, W. Fraser, R. Monroe, W. A. Williams, W. J. Diamond, W. K. Duncan, J. S. Tyson, F. Kreibich, H. Jones. *2nd-class :* O. J. Akers, G. Brown, J. H. J. Davis, J. L. Gichard, J. L. D. Hardy, J. A. Mackay, D. I. Owen, E. P. Samson, P. R. Wale, W. R. Williams, A. Park, W. S. Samuel, P. E. Austwick, N. Grunnah, D. T. Davies, W. E. Francis, C. J. Chubb, B. A. Evans, B. E. Hapgood, J. D. Watts, A. J. Close, B. A. Lloyd, G. F. Price.

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DOVER.—*2nd-class :* H. Richardson.

DUBLIN.—*1st-class :* E. McHugh, R. S. Spence. *2nd-class :* B. B. M. Holmes.

DUNDEE.—*1st-class* C. A. Ferguson. *2nd-class :* J Kidd, G. D. Pattullo.

GLASGOW.—*Extra 1st-class :* A. W. Thomson, T. Miller, P. H. Hunter, W. G. M'Kenzie, J. Paton. *1st-class :* W. Barclay, D. C. Dickson, J. Forrest, G. H. Gray, D. Kerr, C. McNair, T. Martin, R. Thorn, W. Wishart, W. McKenzie, G. Hadden, T. W. Dill, W. A. Jardine, J. H. Ferguson, T. L. Jardine, M. M'Kay, J. G. Hamilton, J. Rigg. *2nd-class :* D. M. Blair, R. G. Dunbar, T. Easdale, G. Goodhall, R. M. Henderson, J. J. M'Kenzie, D. Mackenzie, R. E. Mills, W. Temple, T. Macfarlane, J. M'Innes, A. Graham, J. Major, S. R. Ballantyne, J. G. Lawrence, E. W. Hutchison, W. T. Oliver, J. Macfarlane, S. Manson, W. M'Gregor, G. Aitken, P. A. Gardner, J. Grant, A. Lawrence, T. L. Philip, W. G. Carruth, W. M. Ferguson, A. R. Fleming, C. P. Harding, W. L. Liddle, J. H. Park.

FALMOUTH.—*1st-class :* A. Prettyman, T. L. Coward.

GREENOCK.—*1st-class :* J. E. Haig, J. M'Kendrick, J. M. Paterson, W. Richardson, J. Wilson, D. G. Buchanan, J. M'Lintock, W. Barr, J. Warnock. *2nd-class :* J. Clinton, J. Earles, W. A. E. Harrow, P. Macfarlane, T. S. Mackay, J. Mullen, W. Breingan, W. N. Macfarlane, J. Learmont, M. Wallace, W. Begg, A. M'Phail.

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NORTH SHIELDS.—*Extra 1st-class :* G. Robson, J. Ward, J. A. J. Clauston, H. G. Forster, G. H. Gibson, J. I. Milne, D. F. Welsh, S. W. Gray. *1st-class :* W. J. Chisholm, W. J. Dawe, W. Farmer, E. Gerner, J. T. Hall, J. L. Riddle, R. Turnbull, W. S. Young, J. Boag, W. Cowie, R. Walton, F. Harvey, R. W. Ibbotson, J. W. Greenwell, G. P. Akers, J. Ward, G. Small, R. Knox, G. Matthews, M. G. Morton, A. P. Bell, A. J. Henderson. *2nd-class :* F. Armstrong, L. R. Bang, C. W. Bell, H. Bell, W. Booth, R. Cole, J. E. Cowper, J. Digman, F. Hollingsworth, F. H. Lammas, J. T. Lillie, A. Mundell, F. C. Pelton, W. Roper, J. Thompson, O. Virtue, G. Wardropper, T. Xenios, E. G. Jackson, J. T. Miller, C. D. Caird, W. S. Gibson, A. H. Docherty, T. P. Ferguson, J. G. Heads, F. H. Hill, W. H. Blanchard, J. Hume, R. Law, F. Marshall, F. Monk, J. Watt, H. R. Sutherland, J. P. Thompson, J. R. Wood.

SOUTHAMPTON.—*1st-class :* W. F. Fleming, L. Jackson, J. R. Stephen, A. H. Gidley, E. S. Manning. *2nd-class :* R. Kingdom, W. J. Kinning, N. Wass, H. Date, J. Carnegie, F. Toncri, W. Edgar, A. Dickinson, D. Mackenzie, A. A. J. Bullock, R. J. W. Hally, W. Runham, J. Schoestrand, F. E. G. Coy, J. E. Pile.

SUNDERLANH.—*1st-class :* W. S. Birse. W, Brown. *2nd-class :* J. C. Palmer, G. P. Carr, W. N. Denton, N. Finkle, W. Sheel, O. H. Stanley.

WEST HARTLEPOOL.—*1st-class :* F. S. Banks, F. Drew, F. Fisher, M. Godfrey, G. Horngald, R. Snowdon, J. Stockwell, H. Trip, F. Wardall, S. J. Wardman, P. Pattison, F. W. Hughes, R. L. Curry. *2nd-class :* N. Beatty, J. Dixon, G. W. Jackson, J. B. Sidgwick.

ENGINEERS' CERTIFICATE, BOARD OF TRADE REGULATIONS.—There is issued by the Board of Trade a revised edition of the regulations relating to the examination of engineers in the mercantile marine. An addition to be noted is a penalty for misconduct. Paragraph 10, which deals with this matter, reads as follows :—" Candidates who have neglected to join their vessels after having signed articles, or who have deserted their vessels after having joined, or who have been found guilty of gross misconduct on board, will be required to produce satisfactory proofs of two years' subsequent service and good conduct at sea, unless the Board of Trade, after having investigated the matter, should see fit to reduce the time." A fee of £3 will be charged for examination for extra 1st-class certificate if candidate has not obtained a 1st-class certificate. Future candidates will not be required to have a knowledge of cube root. An amendment in Paragraph 40 will be of interest to engineers serving in pilot vessels. This provides that service will in future be accepted from men in sea-going steam dredgers, fishing-boats, tugs and sea-going pilot vessels. Alterations have also been made in respect of the issue of certificates of service to officers of the Royal Navy and the Royal Indian Marine.

The Marine Engineer

And Naval Architect.

LONDON, APRIL 1, 1909.

THE NAVY ESTIMATES

THE Navy Estimates for the new financial year were published on the 12th ult., and show an increase of £2,823,200 over those of last year. The actual figures are £35,142,700, as compared with £32,319,500 for 1908-9. It is not, however, so much the total amount of the Estimates, nor the satisfactory circumstance that they show an increase, that is the matter of more importance, but the provision for new construction which, as we said in February, has been awaited with anxiety throughout the Empire. The sum actually taken in this vote is £8,885,194, or an increase of £1,349,992 over and above the sum taken for the same purpose last year. Even these figures insufficiently indicate the actual state of affairs, for the sum to be voted for beginning new vessels is £2,285,770. The vessels for which provision is made are four battleships of the *Dreadnought* type, six protected cruisers, twenty destroyers and a number of submarines, for which a sum of half a million pounds is allowed. So far, so good. The improvement upon the modest programme, as Lord Tweedmouth called it, of last year is manifest. Whether it is sufficient for the maintenance of the standard of strength which the Prime Minister accepted not long since is another question altogether.

As all the world knows, this shipbuilding programme is the result of a compromise—a compromise intended on the one hand to satisfy the so-called economists of the Liberal Party, and on the other those who believe that in this matter of national security, if it is a question between a ship too many and a ship too few, the choice must be for the former rather that for the latter. Thus it comes about that instead of putting six battleships in the shipbuilding programme, the number which should be there, only four appear, and the following curious and unprecedented proviso is added :—

> In addition to the above provision for ship construction, His Majesty's Government may, in the course of the financial year 1909-10, find it necessary to make preparation for the rapid construction of four more large armoured ships, beginning on April 1st of the following financial year They therefore ask Parliament to entrust them with powers to do this effectively ; such powers would enable them to arrange in the financial year 1909-10 for the ordering, collection and supply of guns, gun-mountings, armour, machinery and materials for shipbuilding, thus making possible the laying down on April 1st, 1910, of four more ships to be completed by March, 1912

There is no reason why we should quarrel with this plan, provided that it is fully understood that these four battleships are in the programme for this year, and are not to form the programme for 1910-11. This being made clear, there is much reason for satisfaction, whether we look to the welcome relief the new orders should give to the shipbuilders and manufacturers of war material, with the workpeople and others dependant upon them, or to the wider aspect which takes in our Imperial interests and all that is influenced by movements upon the political horizon. Both in the First Lord's Memorandum accompanying the Estimates, and in the speeches he made in the House last month, many other topics of interest arise for discussion. But these are subsidiary to the main issues—adequate provision for the maintenance of our naval supremacy, and further employment for those great firms which, as Mr. McKenna said at the launch of the *Vanguard*, render a great public service to the country and form a most important national asset.

There is the further question of German competition. It is acknowledged that Germany has by admirable organization and foresight stolen a march on us, and is now capable of building and completing "Dreadnoughts" as quickly as they can be constructed in this country. Moreover, if she is ready to foot the bill, she has now all the facilities for laying down eight—and, it has been said, twelve—"Dreadnoughts" every twelve months, and completing them within two years. If she forces the pace at this rate, it is essential that we should outstrip her, which means a relative increase of our own resources, or we must try and stop her in another way. If this alternative should be presented to the British people it could not surprise any student of naval affairs. Nevertheless the contingency is at present a purely hypothetical one, and provided that the Government, while fulfilling its promise to begin eight ships this year, will assure the private manufacturers of a continuance of orders, there can be no question that private enterprise and energy will again, as in the past, put Great Britain well ahead of her rivals.

ENGINEERS IN THE NAVY

WE have felt it our duty many times in the past to draw attention to the position of engineer officers in the Navy, to define the serious disabilities under which they labour, and set forth possible solutions of the problem. The conditions and their attendant circumstances of injustice and non-efficiency, have been recognised and appreciated by the leading scientific institutions of this country, whose efforts in the direction of reform have met with some success ; but the progress is very slow, and the time involved is taxing the patience of the present officers in the service. So deep is our sympathy with the naval engineers in particular, and so keen our interest in the efficiency of the Navy as a whole, that

in spite of what may be called unnecessary reiteration we will again deal with the subject in some detail. A statement has been issued for circulation to members of Parliament during the debate on the Naval Estimates last month which sums up the situation from the engineer-officer's stand-point in very concise, moderate and comprehensive terms. Everyone will admit that the remarkable development and extension of engineering science relative to ships of war in the past fifty years have increased the importance of the engineer-officer as an active factor in the Royal Navy, but their status has not been brought up to line with their increased responsibilities as from time to time their duties have developed. Since 1901 the alterations made are summarized as follows:—1st. The granting of a semi-military title, which is of a purely courtesy character, but carries with it absolutely no disciplinary powers, and merely emphasizes the fact that engineer-officers exercise military functions without possessing the attributes of military rank. 2nd. A slight acceleration of promotion; but it is pointed out that engineer officers as a whole are still much older, rank for rank, than officers of the military branch, and have to serve for longer periods before they obtain promotion. For example, an engineer-lieutenant is not promoted to engineer-commander until he is thirty-seven or thirty-nine years of age, and then does not get the pay of his rank until he has served another four years. The age of similar promotion in the military branch is thirty-one to thirty-four, and the full pay of rank is immediately obtained. In the higher branches greater disparity even than this exists. 3rd. An improvement of pay, but the concession has not been completely carried out, for although the lowest rate of pay of an engineer-commander is twenty-four shillings per diem, yet, as stated above, they are compelled to serve for four years in the rank on the same pay as if they had not been promoted. 4th. Facilities for earlier retirement and the institution of four good-service pensions. With reference to these concessions the engineer-officers recognise that there is some slight improvement in their conditions of service, but they feel that their present status and powers still leave much to be desired, because none of the concessions affect in the slightest degree the vital question, *viz.*, their powers necessary to control effectively large numbers of men under their direction in the engine and boiler-rooms. In order to attain the highest efficiency it is strongly contended that the engineer branch should be included in the military branch of the service; the engineer-officers should be vested with disciplinary powers in their own department; the rank, titles and distinctive uniforms of engineer-officers should be consistent with their legitimate position of combatant officers; the engineer branch should be represented on the Board of Admiralty; there should be departmental representation on court-martials, so that when an officer or man of the engineering department is being tried for a technical offence at least one engineer-officer of superior rank should be a member of the court; the reports on subjects affecting their department should bear the signature of the engineer-officer concerned; the conditions as to number, employment and status of senior officers should be improved; and lastly, a school of engineering be established. In reference to this last feature, it is pointed out that owing to the great rapidity of development in the machinery of the modern warship a methodical system is necessary whereby officers may be instructed in the latest appliances. The school could be extended in time to instruct petty officers and men of the engineer department. It is pointed out that unless reforms are speedily carried out the British Navy will present one of the most curious anomalies in its history, *viz.*, the engineer-officer entered under the present scheme will possess status and disciplinary powers over the engine-room *personnel* superior to those possessed by the head of the department in which he is serving. It may be generally admitted, we think, that the highest training and knowledge are necessary for the engineering branch of the Navy, and as the future engineer-officers have already started their training under the existing engineer-officers, it must be fatal to the ultimate success of the scheme to allow it to be seen that engineer-officers still hold a position of inferiority. It is a matter of satisfaction, we feel sure, to all right-thinking Britons that this question is again brought prominently forward at a time when the public interest has been so deeply aroused in the matter of naval requirements, and it will be recognised that the provision of ships is only one factor for consideration, for we must have also the highest trained engineer staff working under fair and reasonable conditions, in order that the efficiency of the Navy may be high as a whole and its protective usefulness be exercised to its fullest extent for the maintenance of this great Empire and, let us hope, the peace of the world.

THE PRIVATE NAVAL CONSTRUCTOR

At Barrow-in-Furness, on the occasion of the launch of the *Vanguard*, Mr. Reginald McKenna, the First Lord of the Admiralty, said:

"You know at this time we have great dealings with Messrs. Vickers and with one other firm of similar magnitude, and in our usual relations with them we are in the position of buyers and Messrs. Vickers in the position of sellers. But I am happy to say that the relations between us and them are far more cordial than the ordinary relations of commerce. We recognise to the full the great public service rendered by a firm which is able to lay down, to build completely and supply with all necessary machinery

and material a ship like the *Vanguard*. . . . We buy from Vickers', but feel that when they are delivering armaments to us they are rendering a national service. . . . I am glad to have the opportunity of saying how much we prize the good feeling that exists between the Admiralty and the great firms which supply us. . . . . Unless we could rely upon these firms, and know that in any emergency they would be ready to put everything within their resources at our disposal, we could never answer to Parliament and the country for the necessary supplies in order to maintain the supremacy of the fleet. . . . . I regard the existence of the firm of Messrs. Vickers as a great national asset."

Such testimony as this must be pleasant reading to the "great firms" which supply the Admiralty, and must be considered as a fine feather in the caps of Vickers' and the other firm which, though not mentioned by name, can easily be understood to refer to Armstrong's. It is an opinion that one has had to wait for for many years, and it comes at a time when the same "great firms" have to play a sort of second fiddle to the dockyards at Portsmouth, Devonport, Pembroke and Chatham. By no means are these firms having the share they are entitled to expect, owing to the fact that the several dockyards take their now greater share. It is quite true that in the case of war, when the Navy would be called on to play an important part, the dockyards would be very busy; but the onus would fall upon the "great private firms," who possess resources which, as compared with the dockyards, are like a giant to a baby. It is true many of these firms for some years past have been able to declare satisfactory dividends to their multitudinous shareholders, but one or two are just at present feeling the pinch, and in future years may feel it more. Then the question one asks is, that if the Government consider these firms such valuable assets, are they going to see that they do not want for work, and work at such prices as will enable them to pay a profit and keep their machinary up-to-date and be prepared for the emergencies of war? To this country the private yards are the backbone of the Navy, to other countries the envy. No other country in the world is in it with us in the possession of such private naval arsenal resources, and in view of this let us hope that such resources will be fostered by the Government to the fullest extent. We hear of certain express ocean steamships being subsidized as auxiliary cruisers, but we do not hear of gigantic concerns being dealt with except in the ordinary ways of commerce, despite the soft-soap of the First Lord of the Admiralty. Private-yard work is the best work; it is the cheapest work and it is the quickest. The private yard is the one great possession of which all should be proud. Its value in time of war would be enormous; it is a great national asset. Let the Government see that it is encouraged and fostered. In war it would come before the naval dockyard in respect to utility, smartness and resourcefulness.

The Comet's First Passenger Fare.—Referring to the progress made in steam navigation and the comfort in travelling on board ship Dr. John Inglis the renowned Clyde shipbuilder, in the course of his speech at the dinner recently of the West of Scotland Foremen Engineers' Association, related an interesting circumstance connected with the pioneer steamboat the *Comet*. He had himself, years ago, spoken with an old gentleman who claimed to have been the first to pay passage money on board the vessel in 1812. The journey was no further than from the Broomieland, Glasgow, to Dalmuir—a distance now involving the modest sum of fourpence by tramway car—and the fare was four shillings! On this being uplifted—according to his aged informant, by Henry Bell himself—the *Comet* was stopped and waited for half an hour while Bell and his passenger disembarked and adjourned to a wayside inn, where the first fare was liquidated and prosperity pledged to the pioneer passenger steamer. Apparently no facilities for such a ceremony had existed on board the little *Comet*. Now all the facilities and luxury imaginable were the merest commonplace on board ships, especially for those who could pay the fare. The price of some of the state-rooms on board that other Clydeside production—the *Lusitania*—for the voyage across the Atlantic was upwards of £400.

Boiler Repairs.—Passing along the dock jetties of a continental port recently, we were attracted by a tent-like erection near one of the bridges. On approaching near with becoming caution we found evidences of work proceeding under the cover of a sail. Closer inspection revealed a boiler which had evidently done duty in a tow boat for many years, the bottom shell plate, sludge door and surroundings were wasted by corrosion, and at first sight the only apparent method of reliable repair was a new bottom or a sale by auction. The owners' representative, however, had other intentions. The boiler was turned on its side and the man in charge was directing an expert armed with blow pipe and auxiliaries with a view to build up the lacking material by the aid of the oxy-acetylene gas and Swedish iron. A day or two later on examining the boiler it was found to have been made up to the required thickness and the landings of the sludge door brought more into keeping with the requirements of a water-tight joint. The off-hand way in which the repairs were executed attracted one; in place of the boiler makers' workshop and all its accessories, here we saw the enterprising engineer directing operations in a Bohemian fashion untrammelled by the ordinary usages of workshop practice. The process of building up wasted places and welding cracks when they do not occur in a vital part, such as under great tension appears to be greatly extending in use.

AN HONOR FOR MR. JAMESAD AMSON.—At the Institute of Marine Engineers on March 1st the following letter signed by the president and secretary of the Australasian Institute of Marine Engineers, Wellington District, and addressed to Mr. James Adamson, the hon. secretary of the Institute of Marine Engineers, was read by the chairman, Mr. J. M'Laren. "The engineers of New Zealand, by unanimous consent, have elected you a life honorary associate of the Australasian Institute of Marine Engineers, and they beg to ask your acceptance of the position. They further wish to decorate you with the gold emblem of New Zealand in recognition of the magnificent work you have performed on behalf of the engineers of the Empire and for the many acts of kindness and splendid advice and assistance which you have extended to our members who have visited the homeland, especially to our young engineers who have journeyed thither seeking further experience. Our honoured life honorary associate, the High Commissioner for New Zealand, has kindly undertaken to make this presentation to you, and the engineers of New Zealand join in wishing that you may be spared for many years to continue the good work which is part of your being, and to you a labour of love."

THE PRESENT NAVAL CRISIS.

IN answer to a question in the House of Commons on Wednesday evening, the 17th of March, Mr. M'Kenna informed the House that the total number of slips in this country capable of being used for the laying down of ships of the "Dreadnought" class numbered seventeen, including two belonging to private firms who had not yet undertaken the building of large ships of war. Two more could be made available in Government dockyards, and several in private yards if due notice was given to the responsible heads in the firms concerned. In Germany there were fourteen such slips, and two more were under construction and would shortly be ready.

This notice appearing in the daily papers makes one think of the position of the various yards which do not and have not been in the habit of building for the Admiralty.

Before the coming of the turbine most of the marine engineering works of larger size, which devoted their attention to the building of high-class tramp steamers, and passenger steamers, were on the Admiralty list as engine builders. Apart from the slight difference in design from the Naval engine the merchant service engine was similar in construction, and the tools which were used in the one case to-day might be used in the other case to-morrow. As the leading shipbuilding and engineering country of the world, this gave us an advantage over any other country in the reserve which our Admiralty had to draw upon in the case of an emergency. To-day matters have changed to a great extent from that position. The turbine has come, and in the Navy has ousted the reciprocating engine, the same holds true with regard to the larger passenger steamers. The turbine requires special tools for its construction and, as it is quite unsuitable at present for the propulsion of slow cargo steamers, it follows that the majority of our larger engine shops are now no longer in a position to cope with an emergency should it arise. In another way, too, the engine shops which have not gone in for the fast passenger ship have fallen behind, in that the design of turbines has been kept in the hands of a few builders and they, after having trained their draughtsmen, are naturally anxious to retain them, and also the actual design of the turbine being so much a mystery at present there are very few draughtsmen who have the data to enable them to make out the designs of a new propelling set.

The ships for His Majesty's Navy may be divided roughly into three divisions, the large battleships and cruisers, the smaller cruisers and the torpedo boat class. The ships and engines for the first-class are generally built by the firms who build the mail-boat class of steamer for the mercantile marine, while the third class is a speciality which cannot be given out to everyone. It is the second class which might be spread out more so as to give a larger number of firms an experience in the construction of war vessels.

The scheme which is advocated is briefly as follows, let the "Dreadnought" class of battleship and cruiser be built by the dockyards and those large shipbuilding concerns which have in the past so successfully constructed for the Admiralty, and let the third class composed of torpedo boat destroyers and torpedo boats be built by those who have specialized along this line, but let the second class, which is composed of second and third-class cruisers, be given out to those yards which are at present capable of dealing with this class of work, or are willing to lay down the plant which will enable them to undertake it. The engines to be built in the engine shop of the respective shipbuilding firms, if there is one, and if not to be given out to tender. Those establishments which are engaged in the construction of any of the other classes of work to be excluded from tendering. If this were done it would mean the spreading out of Government work over a greater number of firms and workmen, which would mean that in the course of a short time there would be a body of skilled workmen available at all times and, furthermore, there would be a very much greater number of workshops which could be utilized in the event of war disabling our ships, for repair work, without in any way interfering with the work of hurrying on that new work which might be of vital importance to enable the fleet to maintain its position upon the high seas.

This will mean that some guarantee will have to be given to those firms which go to the expense of laying down plant which is quite unsuitable for their everyday requirements, and this might be to the effect that so much work would be set aside every year for those firms. It might be done in some such way as that the average number of men employed by the builder regulated the size of the ship or propelling set for which the tenders were called for, this would exclude under ordinary circumstances those firms which go in for the first and third divisions, into which for convenience the ships have been placed in this article.

H.M. BATTLESHIP "SUPERB."

ON the 20th of February H.M.S. *Superb*, which has been built by Sir W. G. Armstrong, Whitworth & Co., left their Elswick shipyard for a berth lower down the river for the finishing stages and her equipment. She was under her own steam and was attended by five tugs.

She is described in the Navy List as being of 18,000 tons, with an indicated horse-power of 23,000. Her turbine engines are from the works of the Wallsend Slipway and Engineering Company.

On the occasion of the launch of the *Superb* Sir Andrew Noble, K.C.B., gave some interesting particulars as to the earlier *Superbs*. Sir Andrew said this one was, he believed, the seventh *Superb* that had been borne on the list of the Royal Navy. The first *Superb* was taken from the French in 1710, during the war of the Spanish Succession, and her name was Anglicized by dropping the "*e*" at the end of her French name. She saw a great deal of service during the war in the fleet of Sir George Byng. The first *Superb* appeared to have been replaced by a second *Superb* in 1736, and a third was launched in 1762. This latter vessel had not a long career, as she was lost on the Malabar coast in 1783.

Perhaps the chief historical interest attaches to the fourth *Superb*, as it was she that took part in the operations commanded by Lord Nelson at the beginning of last century. She was a 74-gun ship of 1,920 tons, and was launched from Pitcher's yard, Northfleet, in 1798. At that date she was considered to be singular in having no figure-head—a peculiarity shared by the vessel launched that day, and that perhaps constituted the sole point of resemblance in design to the *Superb* of 1907.

The sixth *Superb*, the immediate predecessor of the present ship, was originally built for the Turkish Government by the Thames Ironworks Company at Blackwall. The outbreak of the Russo-Turkish war of 1876 caused an embargo to be laid on her departure, and early in 1878 the Admiralty bought this ship for £443,000, and she was added to the Navy as the *Superb*. She was a good specimen of the broadside type, 332 feet between perpendiculars and 5,350 tons by builders' measurements. She had a belt of 12-inch iron armour, and carried twelve 10-inch guns in a central battery. Her horse-power was about 7,400, and her maximum speed may possibly have reached 14 or 15 knots.

It was stated that the cost of the *Superb* would amount to £1,750,000.

Our illustration shows the *Superb* passing through the Tyne bridges to dry dock.

ship, built to special order, plans and dimensions, by the old-established firm of Messrs. Noah, Sons & Co., Ltd., at their "Asia" yard, and was a shelter decker built to the three-deck rule. From authentic records, her dimensions would appear to have been about—450 L by 75 B, by 50 D, to the shelter deck. She had three decks laid, lower, main and upper, with shelter deck above. She was classed B.C. 40/00 with freeboard, and as she was especially built to carry a [illegible] "tall" ship both inside and out. Depth of water was limited, and she probably had a draught of 20 ft., which with a coeff. of ·880 would give a displacement of 17,000 tons or thereabouts.

The details of specification are not available, but as far as we know them they were not up to Board of Trade regulations in regard to light and air spaces, although the life-saving arrangements were evidently all that was desired. The predecessors of Messrs. Wailes, Dove & Co. coated her inside and out with their bituminous composition.

I have speculated upon the sanitary arrangements, but without enlightenment. Two donkeys were certainly aboard, but whether for ballast or for general service is a matter of doubt. No horse-power is stated. She took a phenomenally long time to build, made one of the longest passages on record, experienced most exceptional weather and finally stranded and became a total wreck.

L. B. and D. are determined by the varying conditions of service; loading and discharging berths or quays; draught of water in harbours or over bars; width of entrances, locks and docks and overhang of cranes, shoots, etc. If for light general, bale or timber cargoes, or if for coals, ores or other deadweight cargoes. The H.P. and speed are governed by or arranged to suit to other conditions.

In regard to *breadth* it might be worth while to consider the question of dry dock accommodation, especially for a ship intended for certain or stated ports, as any extra 6 in. of beam might make it impossible to use certain dry docks which, as one of the necessities of maintenance, is a point for consideration.

Taking the common beams of 46 to 52 ft., extreme, I find on consulting Lloyd's Appendix to their 1908 Register that in the U.K. the public and private dry docks and pontoons capable of taking 350 ft. in length and upwards, average for widths of entrance as follows:—

			No.
Will take	[illegible] ft.	=	[illegible]
	[illegible]	=	[illegible]
	[illegible]	=	[illegible]
	[illegible]	=	[illegible]

Whilst docks capable of taking the larger cargo vessels of 450 ft. and upwards, I find—

			No.
Will take	54 ft.	=	63
	56 ,,	=	60
,,	54 ,,	=	59
	[illegible]		[illegible]
	[illegible]		[illegible]
	64 ,,	=	36

These figures exclude Government Dockyard accommodation in the United Kingdom (N.B., these are not available for merchant vessels except in cases of distress), also gridiron and patent slips. I have in each case allowed for at least 1 ft. clearance between beam of ship and width of entrance stated, which is really too narrow a margin, and if 2 ft. 6 in. is allowed the available docks will be reduced considerably.

In the case of the greater beams of 58 to 64 ft., I would point out that although there are thirty-six available dry docks, these larger docks are mostly in a few ports (Liverpool accounting for eleven alone, of which seven are 60 ft. width of entrance), and in the other cases they are mostly the property of railway companies (Southampton accounting for three dry docks capable of taking 450 by 58 to 64 beam). The dock accommodation for broad beam ships, therefore, is limited more and more as the width increases, and the larger and more in quest the dock, the higher the tariff. Such docks abroad are very scarce and the charges heavy.

Dry Docks.—It is particularly to be noted in going through Lloyd's Appendix, what a large number of docks have their width of entrance out of all proportion to length. Thus, some docks of 400 ft. can only take in 44 ft. in beam, and there are twenty-three dry docks in the United Kingdom capable of taking 360 ft. of length, but too narrow of entrance to pass a proportionate beam of 48 ft. Several of these belong to dock companies or River Commissioners and should long ago have been modernized.

Classification should stipulate to be to latest Home Office requirements and regulations as to Factory Acts, etc. Openings in 'tween decks, etc., to the rules of the Welsh Trimmers' Union.

Scantlings.—These are usually named in brief as to be to Lloyd's (or other classification) rules—but some items can be increased upon to advantage, both in strength and to allow for corrosive waste. Classification rules are *the minimum*, and when parts specially subject to wear and tear and oxidation are reduced to a percentage limit, their renewal is imperative sooner or later.

Steel is the usual material for the modern hull, but weather decks should be of iron to better withstand their excessive tendency to corrosion. It is not necessary to carry the iron to within covered-in spaces or under wood sheathing, and a concession to weight and cost can here be allowed.

'Tween decks and tank tops are sometimes specified to be of iron, and are desirable as such, but the extra thickness is also proportionate weight and cost.

Where I would advocate putting extra scantlings would be

(*a*) Tank margin strakes.
(*b*) Floors, angles and intercostals under engines and boilers.
(*c*) Do., do., under donkey boiler.
(*d*) Division plate floors between all tank spaces.
(*e*) Bottom or coaming plate of each W.T. bulkhead.
(*f*) All bracket plates connecting bulkheads and stiffeners to tank tops.

All the above to be of steel of iron thickness.

Height 'tween decks is entirely a matter of arrangement, but to keep within the rule for minimum scantlings 7 ft. 11½ in. is the maximum. At the same time, for cattle and transport requirements a greater height is desirable, as also for general cargoes, timber, etc., say up to 9 ft. 6 in., top of beam to top of beam.

Height of Erections—above deck—enclosing accommodation, etc., should have a net head-room of at least 6 ft. 6 in., and preferably 7 ft., for the saloon department. The higher the deck erections the greater the top weight and "windage," but in these days good accommodation is required, and air space conduces to health, especially in hot climates. I was over one of Messrs. Holt's new steamers some time ago, and was astonished at the generous spaces devoted to officers' and engineers' berths. To a one-man berth there must have been quite 600 cubic ft. of space—partly due to extra height of deck to under beam. The forecastle area was also greatly in excess of that usually allowed in ordinary cargo steamers.

Heights of Engine and Boiler Casings are as well if carried to height of side houses, etc., and help to secure the maximum deductions from gross tonange.

Windage.—This is a term not often found in text books, and seldom used; yet in the modern steamer must be a considerable quantity and worthy of some attention. Any wind force from abaft is welcome, while a beam is of little account, but when dead ahead is a more or less serious opposition to progress.

The height of hull above water is an unalterable mass, and the form of a bow does not offer a serious resistance—it is the square front of bridge and super-structures that offer a square face to the wind ahead. That these super-structures are necessary, and high navigating bridge and chart houses indispensable to safe and speedy progress in these days of crowded ocean routes, goes without saying, but it seems to me that such upper work might be made in bow form, with considerable reduction to "windage." A bridge front, saloon, upper bridge and chart house, etc., could as well be at an angle of (say) 45 deg. as square on, and resistance would be greatly reduced.

I find from the plan of an ordinary 7000 ton cargo steamer that the front of saloon house, the upper and flying bridge weather screens, and the chart house have a frontage of about 500 sq. ft.

Taking the velocity of wind and pressure per square foot, this gives—

Velocity Miles per hr.	Press. per sq. ft.	As Described.	500 sq. ft. of resistance lbs.	Tons.
10	·492	Mod. breeze	246	·11
15	[illegible]	Fresh	550	·24
20	1·970	Strong	985	·44
30	4·499	Mod. gale	2,249	1·0
35	6·027	Fresh	3,013	1·34
45	9·960	Strong	4,980	2·22
50	12·3	Whole	6,150	2·74
60	17·71	Storm	8,855	3·50
80	31·49	Hurricane	15,745	[illegible]
100	49·2		24,[illegible]	[illegible]

Add to this the forward speed of ship, say 10 knots, and you have a very good reason for the long passages a ship makes in the teeth of head winds and gales + seas. A good strong tugboat will pull about 9 tons and would probably tow a 6000 to 7000 loaded steamer 4 knots under favourable conditions, and a corresponding opposition would be much greater at a higher speed. I think a bow form of super-structure would be a great advantage to speed on all classes of ships, and, from the navigating bridge would give a clear sea view well abaft the beam on either side when standing at the centre position or forward angle. In the case of large liners the opposition due to super-structure must be enormous at fast speeds, and they seem to take this somewhat into consideration by elongation of the funnel areas, although a circular form of even 10 to 12 ft. diameter cannot approach to the direct frontal area of the bridge structure.

Joggled Plating.—I suppose I shall be courting trouble—and controversy—when I say that I cannot understand an owner accepting joggled shell plating in lieu of plain plating! especially if he (or they) carry their own risks. Joggled plating is urged as dispensing with liners and saving weight. Well, so it does, but it reduces the displacement proportionately, and also the grain space. Roughly speaking, a 54 in. width of (outer) shell plate will take say, a 48 in. by $3\frac{1}{2}$ in. by $\frac{5}{8}$ liner on each frame $= 29\cdot16$ lbs.; the *set in* of a corresponding surface of plate, with 24 in. frame spaces, is approximately 24 in. by 48 in. by $\frac{5}{8}$ in. thickness of water $= 28\cdot13$ lbs.

Speaking from memory, I think the saving of liners in a steamer of about 7000 tons was stated at about 25 tons, and the loss of displacement as over 30 tons, and of course, the internal capacity for grain space is proportionately reduced. When it is taken into consideration the considerable extra cost of renewing or repairing joggled plating, it ought to be a sufficient consideration to put against any reduction in the first cost of building.

The joggling of bulkheads (to save weight) would have that effect, and no other disqualifications worth consideration, but for decks and tank tops plating the joggling of the plating, whilst it duly saves weight without reduction in displacement or appreciable reduction in grain space, appears to me to be undesirable on the score of carrying water both on decks and tank tops in the saucer-like depressions of their respective surfaces, and I think I shall not be contradicted when I say that the less water that hangs about the decks and tank tops the better.

Some builders meet such objections entirely by joggling the frames. This method reduces the weight of liners without any corresponding reduction in displacement or grain space plating is plain throughout and repairing costs normal. If a frame is damaged or cut, it can, of course, be repaired or renewed and liners fitted as ordinarily. In any case—where joggling of the shell plating is quoted or arranged for—I would strongly advocate that the bow plating—to abaft the collision bulkhead—should be plain plated; then, when the inevitable collision *does come* the cost of repair will not be abnormal—especially if it has to be done abroad. Anything like special sections (such as joggled plating and Z frames) are worth serious consideration for future possibilities of repair—and the same applies to abnormal sizes of shell plating or unusual sections of beams or frames, as in the event of a considerable damage being experienced such material is not to be found anywhere in stock, and rolling mills will not put in special rolls for a small order.

Double Bottom.—This is now built almost universally on the "cellular" principle. The usual practice is to carry water ballast fore and aft—with the frequent exception of "[illegible]" and often in way of hold wells. No doubt an open bilge or tank under boilers conduces to less deterioration of the floors, angles and plating in way of the heat, than when subject to the "sweat" of a closed tank, but much depends upon the coating and ventilation of such spaces. The arrangement of bilge wells—as frequently fitted—across the ends of hold spaces seems to me to be undesirable in view of the very small normal drainage in such spaces.

It is generally claimed (or spoken of) that the modern double-bottomed vessel is a safer ship and less liable to total loss by stranding, etc., than a single-plated or open bilge bottom; but unless that double bottom is entire from the collision bulkhead to the after bulkhead any open bilge or well *is* a single bottom space and as likely as any other to be holed—in which case the whole adjacent space is flooded, and if this is the engine space then the ship is rendered quite helpless to assist herself. A ship with an entire inner bottom may rip open her bottom shell plating and still float in safety but with sections not so protected the danger of "holeing" is serious and very probably many such a ship has been lost that might—with a continuous double bottom—have been saved.

Stems.—These are almost invariably now specified as "straight," and the clipper bow and short bowsprit, or the "hook" nose, are rarely seen in the modern tramp steamer. 15 ft. of "Anxiety" I have heard to aptly describe the sailing ship bow when built on a steamer. Some builders give a little forward rake to the stem—about 2 ft. at the head—the idea being that in a collision the upper part would suffer most and the lower the least.

Stem Bars should always, I think, be scarped at the light line, and in large vessels I do not see why two such scarphs should not be fitted to minimise the repair when the inevitable collision or damage to stem comes along. Very frequently a scarph saves the one half of a stem having to be dealt with; it is, however, important that no "tack" rivets are fitted—as sometimes there are—as in that case the plates on each side have to come off to get them out. The scarph is quite sufficiently bound by the through stem riveting, the same as in the case of keel bar scarphs.

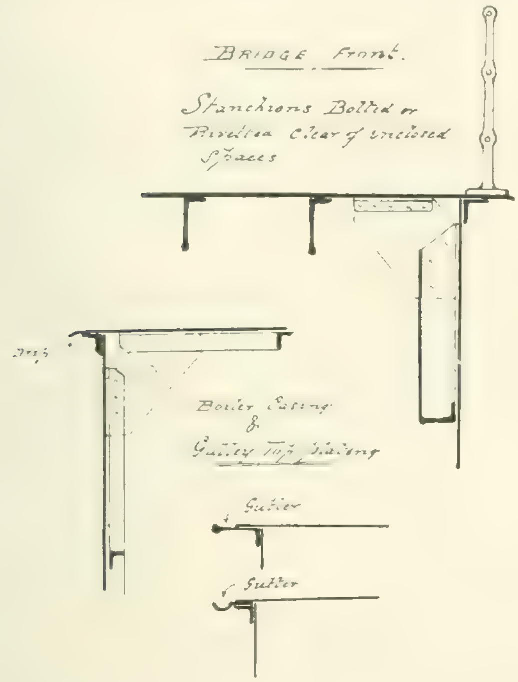
Stern Post is now very frequently made of cast steel, but of the advantage of that metal over the older form of wrought iron, there can be no other claim than that of cheaper cost. Of the disadvantages of cast steel *versus* wrought iron, there are but two important ones, *viz.*: a greater first cost for wrought iron (although this is not great), and the irrepairability of cast steel, as against wrought iron when the former is broken or fractured. Wrought-iron frames, until quite recently, held the field on account of reliability of structure, flaws in welding being rare, and when found ofttimes being repairable in place, or at any rate being temporarily dealt with, either at home or abroad. Cast steel—on the other hand—has been, until quite recently, more or less undependable and subject to the sudden appearance or development of latent or vibratory flaws, in which event there is no alternative than entire renewal; and this, in the case of cast steel, is a matter of time.

I have only to add, in this latter respect, that the casting of steel has in late years very greatly advanced in regard to soundness of castings and their reliability, but were they *in every respect* equal to wrought iron, I would still throw the die in favour of wrought iron, on account of repairability. This brings me to a point I would like to emphasize, *viz.*, that cast-steel frames are generally made in two pieces, with scarpled joints, and I do not see why wrought-iron frames should not also be made in sections, and especially so in regard to the rudder or "after post." This latter carries the gudgeons or bearings of the rudder, and if same could be easily removable, whether of cast steel or of wrought iron, for reboring purposes, would be very much better for that very much used, much abused and hardly used piece of machinery—The Rudder!

The difficulty and expense of reboring rudder gudgeons in place is such that these are frequently found to be much out of line, and the bushings oval. If a rudder post could be easily unbolted and taken to and bored out in the lathe, a better working rudder and considerable easement on the steam (or hand) gear would be the result. The rudder post, or after post is after all nothing more or less than a "hanging post," and provided the sole piece is sufficient to carry the rudder heel thrust, and the rudder stock strong enough to

carry its own strain between upper and footstep bearing, the rudder or after post is dispensable, as in warships and other rudder-postless vessels.

Bilge Keels to the modern flat-bottomed keel-less ships are, I venture to say, indispensable. That plenty of ships are built without them (especially if " spec " ships) is no proof of their uselessness but of cheapness. Such ships roll badly and are very liable to shift their cargoes. They are also " dirty "



ships in bad weather and give everybody on board a very bad time. When dealing with such ships and having fitted bilge keels, say from mast to mast, the captains have invariably declared—after the next voyage—that " it was not like being in the same ship." Bilge keels are frequently put on too small, and their effect is hardly worth the expense. For " two-thirds the length amidships " is a good rule, and just extends (in a full ship) from the beginning of the rounding at each end, *viz.*, for the length of the straight of the bilge. Such keels should be (approximately) the depth, on each side, that the centre or bar keel would be if she had one—*viz.*, about 10½ in. to 11 in. in a 7000 tonner. There is no fear of a steamer, so fitted, rolling with too quick a motion, and a steady ship in bad weather must get along better than one that is putting her bulwark rails under, and pitching the coal in the stokehold from side to side.

Bilge keels are fitted to the bilge plating, either with an angle or a tee bar. The size in either case would be about 6 in. by 4 in. by ½ in., and the riveting " reeled." I always specify that " the angle (or tee) to stop in way of plate laps or butts, and the bulb plate to be in short lengths (say equal to plate lengths) with double straps at joints." When so fitted any one damaged bilge shell plate can be taken off or renewed with a minimum of disturbance. Fore and after ends of bilge keels should be tapered away for fully 4 to 5 feet and rounded in to the shell plating—not by shearing off the bulb (as I have seen done), but by shearing off the back of the plate and furnacing and setting back the front portion.

It is advisable to keep bilge keels well in to avoid damage from the " batter " of dock and quay walls, and as it is equally desirable to keep them well up, the best position to suit both requirements would seem to be that pointing to the angle formed by the intersection of the perpendicular line at side and the line of rise of floor.

Ballast Tanks in Double Bottoms.—Probably no feature of a modern cargo steamer is so capable of improvement by the shipbuilder as these. In the greater number of steamers the tanks (or some of them) (*a*) are too large, (*b*) badly arranged as to effect upon trim when in or out respectively, (*c*) seldom sub-divided, (*d*) slow to fill and empty, and (*e*) difficult to drain.

The usual thing is just four divisions fore and aft, with sometimes a small tank under engines and boilers. This means in a No. 2 tank of a

	3500	tonner	180 to 200	tons of W.B.
in a	4500		200 to 250	,,
,,	5000		250 to 350	,,
	6000	,,	300 to 400	,,
,,	7000		350 ro 450	
,,	8000		400 to 500	,,
,,	8500	,,	450 to 600	,,

depending, of course, upon lengths and beams of respective ships, but these approximate figures are taken from actual plans. The No. 3 hold double bottom and the Nos. 1 and 4 hold tanks usually follow in size in that order.

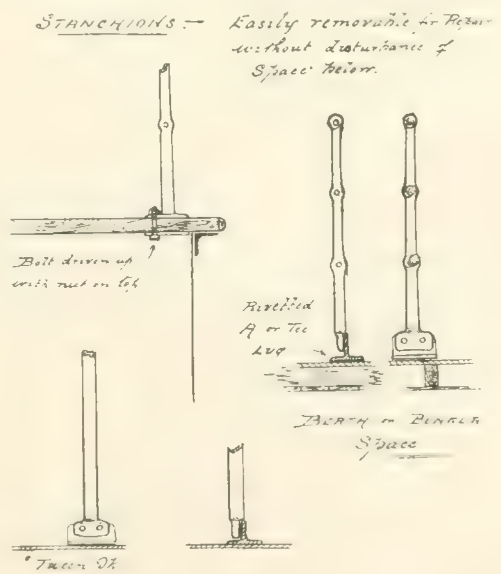
It is very desirable that no single tank should carry more than (say) 150 to 200 tons. Even 150 ton water weights when slacked back, are causes for anxiety when a heavy deck load is present, or when a ship is " flying " light and upper bunkers contain coal.

By the sub-division of tanks—fore and aft way—a great gain to stability and means of trim from side to side is attained.

I consider that " the double bottom should be sub-divided from mast to mast," or in other words, the keelson plate is watertight and suctions, etc., are in duplicate on the engine and stokehold bulkheads respectively.

This arrangement costs very little extra, as no tank pipes are led through floor spaces, but only an extra tank valve with centre and wing suction at each end of machinery space.

For greater sub-division of the double bottom, in large vessels, I should be inclined to *sub-sub-divide* fore and aft, rather than extra tank divisions athwartships, on account of simplifying the suction and filling arrangement and entry and examination of the double bottom afloat and loaded. As it is now usual (and much the best) to bring the Nos. 2 and 3 hold tanks one space into the engine-room, such entry is at all times possible — when the tanks are empty, or it can be kept under (if leaking) by the ballast pump. The after tank or tanks can always be so examined by manholes fitted within the tunnel, and the only tank—in general—that cannot be examined under loaded conditions is the No. 1, and this difficulty I have got over by fitting two



manholes (one on each side the centre keelson) with W.T. bolted plate covers, at the *bottom of the collision bulkhead* and accessible from the bottom of the fore peak. Needless to say, it is important that the studs and nuts are on the *fore* side and not *inside* the No. 1 tank.

For accessibility and examination of tanks the manholes in floor spaces are very often small and their edges very

rough. The manholes in tank top are frequently as far apart as twenty spaces = 40 ft. There are often no means of getting from one side to the other of the centre keelson plate, and manholes are sometimes found under pipe lines stools or girders where entry is impossible. For easy access to the double bottom manhole doors should not be (approximately) more than 10 to 12 spaces apart fore and aftway—size, say, 18 in. by 14 in., and in duplicate P. and S. The minimum openings in floors should be as nearly as possible 24 in. by 18 in., and if larger so much the better.

TANK FILLING AND SUCTION PIPES.—These are—too frequently—very small and often inadequate, especially to the after peaks. It is not reasonable in a modern up-to-date cargo steamer that it shoould take *more* than (say) eight hours —a working day—to either fill or empty the tanks. . . . This time need not include draining, which depends upon the trim of ship, but to get the gross weight out, say to pass a harbour bar, a docksill or to enter a dry dock.

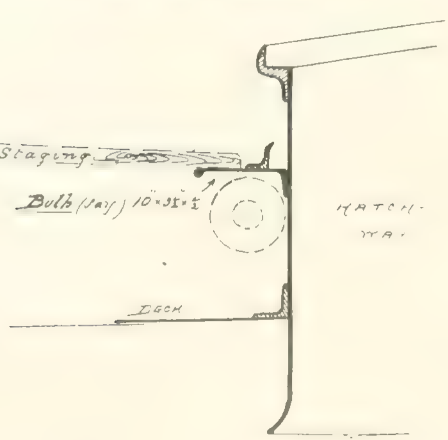
Any sea-going engineer here will bear me out that 4 to 6 hours is frequently necessary to fill or drain one single tank and I have known 8 to 10 hours required for a large after peak of 130 tons, due to nothing else than a badly arranged 2-in. pipe through the tunnel. The smaller the pipe is the more quickly and more permanently it becomes corroded up, for the larger pipes seem to cast off their oxidation from time to time—probably due to the action of various river waters—or, at any rate, are capable of being cleared by hammering and sponging.

Lloyd's rules only specify for the *minimum* size of centre or wing suctions up to 3½ in. dia., but without any regard as to *size* of double bottom space or quantity of water to be dealt with. For my own guidance when drawing out a specification, I take a *minimum* of 3 in. dia. for any bilge or tank pipe (whether centre or wing) throughout a ship of the size I am stating up to 50 tons of W.B., and for centre suctions ½ in. extra dia. per extra 50 tons—or substantial part of 50 tons, and for wings 3 in. up to 100 tons and ½ in. extra dia. per 100 tons (or substantial part of 100 tons) extra. This gives for (say) a No. 2 single tank of 250 tons, a centre suction of 5 in. dia. = area 19·635 □ and 2 wings of 3½ in. dia. = areas 19·25 □; total 38·88 area; equal to a main tank pipe of 7 in. dia.

Taking a *lightship* as drawing 9 ft. mean and the tank valve 2 ft. up, "Molesworth" gives the floor of water in a

6 in. straight pipe 100 ft. long as 795 galls. per min.
7 ,, ,, ,, 1175
8 ,, ,, ,, 1648

HATCH COAMING Stiffening—
& WINCH PIPE PROTECTION



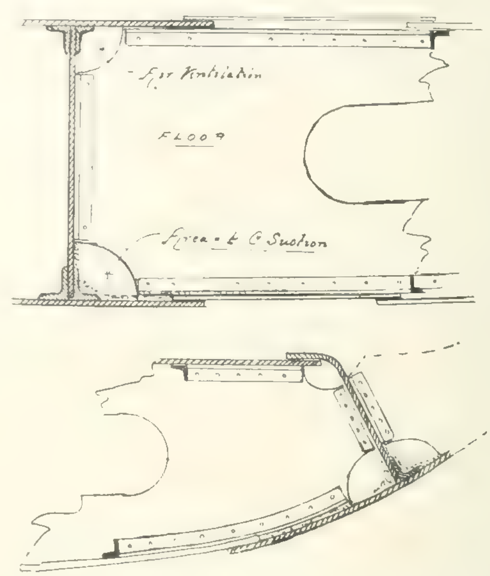
These equal 212, 315 and 440 tons per hour respectively, and the size of tank pipe governs the number of tanks that may be filled at one and the same time, whilst the size of ballast pump or pumps governs the output.

From these quantities I should deduct (say) one half for bends, angles, valve boxes, etc., leaving for 6 in., 7 in. and 8 in.—106, 157, 220 tons respectively.

A duplex pump for low service will discharge approximately as follows :—

Suct.	Disch.	Cyl.		Pump.		Stroke.	Tons p.h.
4½	4	6	×	6	×	6	50
5	4½	7	×	7	×	8	75
6½	6	8	×	8	×	8	110
7	6	8	×	9	×	8	130
8	8	9	×	10	×	10	170
8	8	9	×	11	×	10	200

AIR & WATER CHANNELS in FLOORS of DOUBLE BOTTOMS



A 7 in. tank pipe and ballast pump suction therefore would fill or discharge (approximately) 1,000 to 1,200 tons W.B. in 8 to 9 hours, which, for the purpose of my remarks is sufficiently near to practice.

As illustrating my point further I asked a firm a little while ago if they had any data *re* tank suctions, etc, and this was their reply.

"We have very little reliable data as to the pumping of ballast tanks, etc., as this is a matter upon which we have very few opportunities of getting any figures. We had a pumping test about a year ago on a large steamer, the following being the ballast tank capacities :—

No. 2 tank	353
No. 3 tank	261
No. 4 tank	218
No. 5 tank	52
No. 6 tank	131
Fore-Peak tank	458
After-Peak tank	199
	1672

"The main ballast suction in this case was 8 *in. bore*, The whole of this ballast was to be discharged in *six hours*, (exclusive of draining) and for this purpose we fitted—

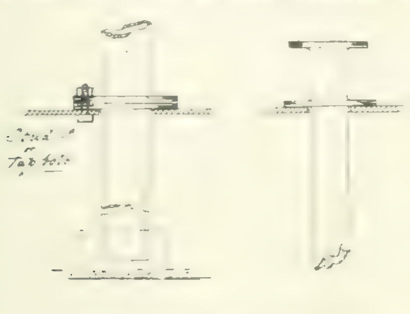
1 Rotary ballast pump 11 ft. 9 in. by 10 ft.
1 Duplex ballast pump 10 in. by 12 in. by 10 in.

These pumps are rated at 100 and 200 tons respectively."

I am convinced that a large amount of donkeyman's overtime and extra cost in coal is incurred by small tank suctions and ballast pumps—lending frequently as it does to continuous working to get out the water ballast in time for completion of coal and other rapidly loaded cargoes. For above 1000 tons water ballast two ballast pumps should be fitted, capable of pumping from forward and aft respectively. If two sea inlets are fitted then any tank forward or aft can be filled or emptied at the same time if an alteration in trim is required quickly. Also by a separate connection an after tank can be pumped direct to a forward tank and *vice versa*—all of which such arrangements come

to be very useful and oftentimes conduce to despatch in the life of a modern ship.

TANK SUCTION.—Drop pipes are usually fitted internally, and through-bolted with the connecting pipe above or on the other side. This arrangement necessitates two men to make a joint (one inside the tank) and the pumping out and entrance [illegible]



A better way, and a cheaper to fit in the first instance, is to cut the hole the full diameter of the *outside* of the pipe and let the joint be outside—*viz.*, on the underside of the flange —and the next pipe to joint on face of same. This permits withdrawal of a suction pipe with a full tank.

TANK DRAINAGE.—I am persuaded that much of the deficiency in cargo dead weight (which varies mysteriously) is frequently due to the inadequate arrangements for effective drainage of ballast tanks. In most vessels the floors abut against the centre keelson plate, and the only means of drainage below the manhole opening is—generally—a 2 in. hole at the lower corner of the plate, and a $\frac{3}{4}$ in. or $\frac{7}{8}$ in. hole through the angle near the centre keelson. This lower drain hole is a rough hole, and is easily choked by waste wood or pieces of cement.

I have known cases—when under survey or repair—that double bottom tank spaces have been found full of water up to the manholes—sometimes in twelve to twenty spaces, and probably accounting for 25 to 30 tons of cargo. Yet the sounding rod would not detect this as it is generally in the after end.

A ship with a very flat floor, when on even keel (or especially if a little by the head) cannot possibly be pumped out, with small drain holes, to less than $1\frac{1}{2}$ in. to 2 in. of water, and this would represent many tons of actual weight throughout the double bottom of a large vessel. Rise of floor should be at least 9 in. to ensure efficient removal of the water ballast, and floors should be made to give ample air and water passage at the respective corners.

RUDDERS.—One need not refer to types of these; the single plate built rudder holds the field and needs no comment. As to the merits or demerits of cast-steel *versus* wrought-iron rudder frames—they each have their advocates—but I can only conceive a preference being given to the former on account of lesser first cost. In my experience I have seen several cast-steel frames renewed in wrought-iron, but never *vice versa*. The insidious cracks which so frequently develop in cast-steel frames are non-repairable, but a broken wrought-iron frame can be dealt with at the forge—at home or abroad. A broken cast-steel frame means a new one, and that is a serious matter in point of time.

RUDDER HEADS are all the better for $\frac{1}{2}$ in. extra diameter over rule to guard against excessive wear in way of the gland, and also permits of the rudder area being increased if found necessary, or desirable, at a later date, which is not possible with a rule diameter head—as I found out not very long ago when, after having had a 6 in. strip riveted on the back of the rudder of a bad steering ship, an energetic and courteous classification surveyor showed me the urgency of taking it off again.

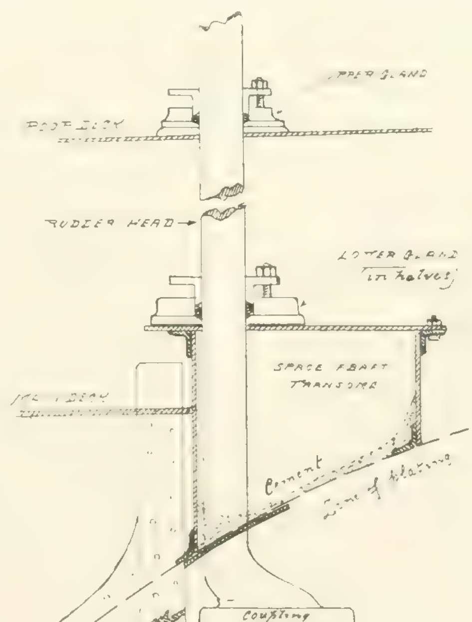
RUDDER TRUNKS are a costly piece of flanging, very confining to the shipment or unshipment of a rudder and liable to leakage. A better and cheaper way is to fit a water-tight intercostal plate about 24 in. abaft the transome frame in the centre cant frame space, and plate over the top. A water-tight packed gland (which should be in halves) then completes the job: the hole in this covering plate should be oval to permit the rudder—when dropped down—to be withdrawn at an angle. The upper deck (poop) gland beneath the quadrant is required as usual.

RUDDER PINTLES AND BUSHINGS.—These are a source of continual wear and expense, as usually fitted. Iron pintles and iron bushes (or both steel, as most probably they generally are) are the most common type of fitting and corrode and wear rapidly. Lignum vitæ bushes are often fitted in conjunction with brass-sleeved pintles, but soon wear out; Brass bushes and brass-sleeved pintles run well if thick and with plenty of surface, but in the presence of sandy water soon grind away. The inverted bush is a good principle, and permits of rebushing the upper gudgeons without lifting the rudder, but if the bottom pintle is done the same it means a special form of after sole piece and provision for carrying the weight of the rudder other than a footstep.

The last ship I had to rebush and fit new pintles throughout I took the advice of the repairers—(who had recently done a job that way—at, I believe, the superintendent's order) and fitted all new solid cone-bottomed bushes of wrought iron, and cone-ended pintles to suit. Each pintle was a bearing pintle—five in all—and so fitted, the rudder cannot work sideways. This vessel has not yet returned from an Australian voyage, and I cannot report upon same!

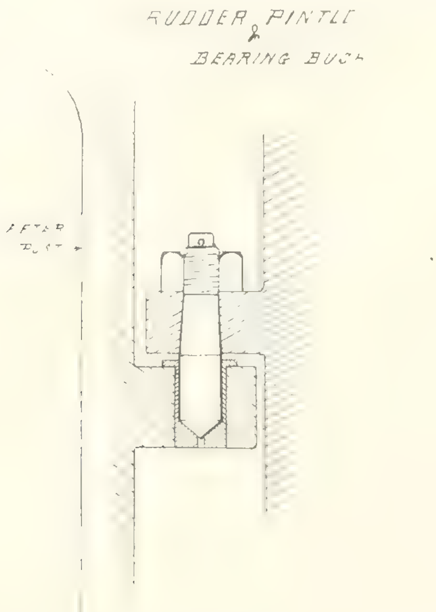
In the old days of the hand tiller and later of the after hand-steering gear, it was no doubt necessary for the rudder to be pivoted and to work as easily as possible, but in these days of steam gear it seems unreasonable to carry the weight of an iron rudder—say, 6 to 7 tons—on a bottom pintle of (say) $3\frac{1}{2}$ in. diameter; the consequence is the wear down of the rudder in a few months. My own practice is to fit a wrought-iron solid washer ($\frac{5}{8}$ in. to $\frac{3}{4}$ in. thick) between the gudgeon and brace of alternative pintles, and carry the weight of the rudder on these thrust collars.

MASTS for carrying sails, or as mere signalling poles, are altogether apart from and cannot be compared with, the "posts" required for carrying loading and discharging gear. Lloyd's rules only give sizes and scantlings in relation to length, *viz.*, from cap to keelson. Taking the Manchester Ship Canal bridges as 70 ft. of maximum height above light load line + a light load line of 12 ft. minus (say) 4 ft. depth of double bottom, and we arrive at a rule length of 78 ft., which gives a diameter at deck of 26 in., keel 20 in. and head



$17\frac{1}{2}$ in. dias., and a thickness (at deck) of $\frac{8}{20}$ in. only, and in a rule-built vessel we get masts insufficient in strength for the hoisting in and out of weights at the ends of derricks. Obviously, the broader the vessel's beam the longer must be the derricks to put a load over side, and the greater the leverage and bending strain at or from the masthead. By taking the rule size a builder need only put in the same

diameter for a 40 ft. as for a 50 ft. beam ship, but the weakness for the latter must be apparent, where for the former it might be sufficient. For the former a derrick of about 35 ft. to 36 ft. would plumb the ship side at Nos. 2 and 3 hatches, but for the latter a length nearer 44 ft. to 45 ft. would be necessary. A modern vessel is expected to easily handle 5 to 6 tons, and even up to 10 tons is frequently named in charters.



The staying of masts, too, or *the rigging* is not such as one would stay a derrick post ashore. The usual three shrouds on each side, of $3\frac{1}{2}$ in. rigging wire, together with a fore and main stay (both in the way of the swing of derrick head) leaves much to be desired. I have frequently watched the masts when discharging iron ore and log timber, and the strain and vibration at the masthead is, in many cases, quite alarming.

Masts are sometimes found to be stepped upon a single beam and with only a $3\frac{1}{2}$ in. round stanchion beneath for support. I had two such vessels to deal with not long ago, the beam being set down $1\frac{1}{2}$ in. I have no idea as to the "down" strain due to the setting up of rigging, but it must be several tons (say, 25 to 30 tons). In a sailing ship of square rig, the weight of mast and gear would be (approximately) 25 tons and the pressure on step due to setting up of standing rigging about 60 tons—a total of (say) 85 tons.

In some recent specifications I have made the size for masts at the deck (for vessels of 5000 to 8000 tons) having beams of 48 to 52 ft., to be equal to $\frac{1}{2}$ in. dia. per foot of beam + 4 in., and proportionate to rule at heel and head, etc., and scantlings as for iron, although built of steel. This gives for a 48 ft. beam a 28 in. mast. which looks, and is, none too heavy. This gives $\frac{1}{2}$ in. plating of the deck and is little enough where double derricks are fitted both on forward and after sides. It will be noted—by referring to Lloyd's Table 9, that a 28 in. mast secures its being built with longitudinal angles—a great gain in resistance to bending or buckling. Personally, except for the conservation of appearance, I do not see why masts should not be even larger in diameter and made to be up-cast ventilators for the holds—with proper provision to protect against rain getting in when rolling to an angle.

A great departure from the *mast* (as hitherto understood) is the heavy derrick posts and lattice girder tie adopted recently in some steamers—notably in the Holt Line steamers, of Liverpool, which all goes—and none too soon—to break away from the old sailing ship style.

DERRICK POSTS are generally too short to give the necessary lead for a derrick topping lift or span, and too small to lift a substantial weight. They want to be quite 28 to 30 ft. high and 24 in. dia. at the deck, to carry a 10 to 11 in. derrick and lift ordinary cargo.

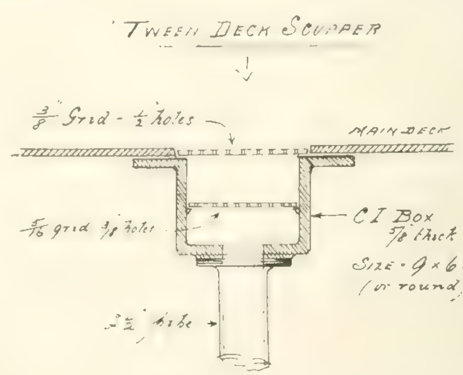
RIGGING FOR CARGO STEAMERS.—For the support of a 28 in. mast I have adopted, in recent vessels, the staying as follows—with the masts perpendicular to the keel—2 = $3\frac{1}{2}$ in. wire shrouds or standing rigging on each side of each mast, spread 4 ft. to 4 ft. 6 in. at the deck and shackled singly at the masthead band. These are "rattled" down, respectively with iron bars or American elm rails, wire-bound to the two shrouds; a pair of wing shrouds or stays (also on each side) spaced as wide apart as the outward swing of the derricks permit—about 24 ft. apart at the deck—of $4\frac{1}{2}$ in. wire. This gives a strong and nearly four-square staying to each mast. These wing shrouds are separately shackled to a second masthead band — independent of the standing rigging bands, and so doubling the security against accident. The usual fore and main stay are fitted to carry stay-sails if required, but these can be safely let go and the derricks allowed to work across the ship if required. All stays set up with extra strong rigging screws. The wire rigging only served 12 ft. up and 6 ft. down, so permitting of examination of the wires—which, if carefully and properly treated, will not take any harm. With such staying and proportionate fittings there need be little fear of accident to masts.

It is not sufficient to rig a mast for a maximum dead load of stated weight, for whilst a heavy piece of timber may not weigh over 4 tons, yet the strain in "breaking out" such cargo is quite beyond calculation, and will frequently carry away a $2\frac{1}{2}$ in. wire runner—the breaking strain of which would be fully 12 to 15 tons, and, to that extent at any rate, the mast derrick and gear has (if even for a moment) been undoubtedly subject.

BAR RAILS.—These are details which are worth some consideration, as the method of fitting, their height, strength and rigidity greatly affect after service and repairs.

The Board of Trade rule for the minimum height of rails on passenger steamers is 3 ft. 3 in. above top of deck, and the lower or between rails to be so spaced that there is no danger of falling through, *viz.*, about 9 in. In the case of cargo vessels I know of no such rule and height will be found down to 2 ft. 8 in. Personally I consider that 3 feet is a good standard of height and ample.

Two lower or intermediate rails on forecastle, poop and bridge, and one on upper and flying bridges and charthouse (if fitted with weather cloths)—*viz.*, two and three rails respectively—seems to be the usual thing and is sufficient. Diameters of bar rails differ with various builders — but a $1\frac{1}{8}$ in. solid top rail on poop bridge and forecastle, with lower rails of $\frac{7}{8}$ in., and on upper bridge a top rail of 1 in. and lower of $\frac{3}{4}$ in. is a good standard, without being either too heavy or too light.



The stanchions and their spacing is important to the general strength of bulwark rails, and especially so on the bridge amidships, where boards are frequently lined on the inside and bunker coal carried on deck, in summer time. For the strength of bars I have given stanchions are approximately $1\frac{1}{2}$ in. at top and 2 in. at the lower part on Poop Bridge and forecastle and $1\frac{3}{8}$ in. and $1\frac{7}{8}$ in. on upper bridge, whilst a flying bridge and charthouse may be lighter still, say, $1\frac{1}{4}$ in. and $1\frac{3}{4}$ in. respectively.

For vessels without bulwarks and fitted only with rails, the main deck rails (on a 7000 tonner) should not be less than $1\frac{1}{4}$ in. top and 1 in. lower, and stanchions $1\frac{5}{8}$ in. at top top and $2\frac{1}{4}$ in. at bottom. Spacing of stanchions should

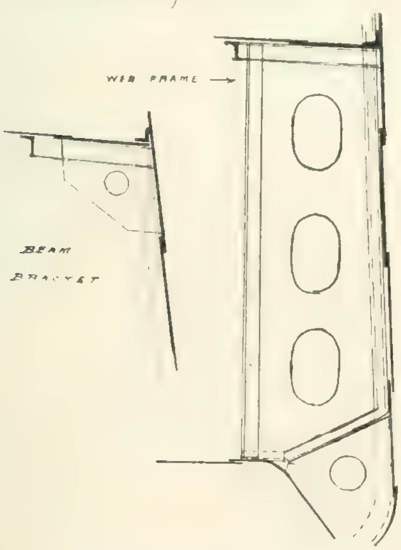
not be less than 3 ft. 6 in., nor wider apart than 4 ft. It is important that the feet of stanchions should be strong and well adapted for the deck they are to stand upon, and whether four or three or two rivets or bolts. Their varying forms of square, triangular or oblong depends upon space and position. Upon wood decks or wherever bolts are used, I always specify that the bolts are to be driven up from under-deck, and the nuts on top of foot. This enables a leaky stanchion foot to be rejointed or repairs to rails and stanchions carried out when spaces below are filled with cargo, or are lined—as in the case of berths, saloon, etc.

Rails are usually wedged up in, or caulked in way of line stanchions, and lightly riveted over at the end stanchions. Any through drilling and pinning is to be deprecated on account of any future repairs or renewals. The butts of rods are very generally arranged to come in way of a stanchion ball, but unless carefully divided off the shallower rod is very liable to draw out when bent. For butts between stanchions a usual plan is a pipe ferrule drilled and through-pinned, but as a rule they are fitted too short and too slack. I think that four diameters is little enough for length of a rail ferrule. A neat arrangement is (where diameters suit) to screw the ends gas thread and run on a running joint steam pipe socket. This requires no caulking or pinning. Iron piping is freely used in light draught vessels—but to be equal in strength to solid bar requires to be approximately equal in bore to the diameter of a solid bar.

Scuppers.—On weather decks. The cutting of the gunwale angle bar is a poor job and conducive to leakage, and if leaking is very difficult to caulk properly. The flanging of a scupper in the deck angle bar, and the retention of its continuity is a better job than the above, but the water cannot drain right away to less than the thickness of the bottom flange. Much the best weather deck scupper is the under-deck or Collinson type, permitting the draining away of all water. Also, in the case of shelter deck or other spaces exempted from the tonnage measurement, such scuppers are easily and effectively closed—when carrying dry or other cargoes—by a cast-iron button or lid, and crossbar dog and through bolt.

'Tween Deck Scuppers.—These are generally most ineffective and easily choked—being lead pipes of small area with a brass rose placed on the deck with a few $\frac{1}{8}$ in. holes in

LIGHTENING of STRUCTURE



same. For a shelter decker with 'tween decks specially arranged for horses, I had special cast-iron hat boxes made which were approved and favourably commented upon by the transport inspector. It had the merit of giving large surface—of draining absolutely all water off the deck, and permitting of raking over to clear away straw, etc. The lower or internal grid is to catch the refuse which passes the upper or coarser grid. Both are easily lifted, cleaned and replaced. Other shapes and sizes would, of course, commend themselves on similar lines.

LIGHTENING of STRUCTURE

Hawse Pipes.—These, as usually fitted, are a compromise between a lead for the chain and to facilitate the "stowing" or "housing" of stockless anchors, and are a bad lead—at the top—for the cable to the windlass, resulting in the cover plate and upper end of the pipe being quickly cut through with consequent leakage into the forecastle spaces. A "steep" pipe is necessary so that the anchor shank hauls in, but a good roller—with chain groove—would suggest a remedy for the excessive "nip" at the windlass lead and greatly ease the strain on the engine. I have never seen any such roller sheave, but a rough sketch will illustrate my meaning.

Double hawse pipes, as sometimes seen on old vessels, are most convenient for mooring to buoys, as the anchor can be secured in its own pipe, and the unshackled cable put down the smaller pipe. I have seen a hawse pipe fitted right aft, with a stockless stream anchor "housed" in same, with a special drum on the after winch, and a screw stopper for heaving on or holding the wire hawser. It commends itself as a very useful fitment for vessels trading in narrow waters (where grounding is often almost unavoidable) as being quickly available for laying out the stream anchor. Also for a "drag" aft. Both the former and the latter are especially suitable for vessels mooring to berths between buoys.

Lightening of Structure.—It seems to me that instead of devoting considerable ingenuity to the reduction of scantling in a hull, the ship-draughtsman might to a considerable extent follow the structural steel and bridge builders' designs in regard to lightening floors, webbs, stringers and brackets, and thickness in lieu of width. For after all the main object and the end of a ship is to make profit for her owner or owners, and hold obstructions are a loss of convenience to loading and discharging; and where two methods can be submitted the one with the least obstruction is the best. I would rather have a webb frame 36 in. wide by 1 in. thick, than one 72 in. wide by $\frac{1}{2}$ in. thick (supposing same was equally acceptable for classification) and, apart from actual width, I would rather have a $\frac{3}{4}$ in. thick bracket, lightened by punching to the weight of $\frac{1}{2}$ in. bracket, on the the score of corrosive waste—for I am very much persuaded that light scantlings corrode and waste away more than thicker ones, due, I think, to the extra vibration in thin material over that of thick. Beam brackets might be lightened without reducing strength, by punching (say) 3 in. to 4 in. holes in same; webbs by punching in manholes (as in floors); and bulwark bulb stanchions by 2 in. to $2\frac{1}{2}$ in. holes. All of which holes or orifices would conduce to better

ventilation and the trimming of cargoes—especially for grain—and might, I think, reduce in some degree the weight of hull, such holes and lightenings conducing to ease of erecting, staging in holds, for lashing or shackle eyes, and generally for convenience in working the ship and cargo.

CLEAR DECKS.—I should like to make an observation regarding the desirability and easy possibility of clear decks "from or between erections, and from hatch sides to bulwark rails or stanchion." Clear decks are indispensable for the carrying of deck loads of timber, and for cattle or transports. One not infrequently finds hold ventilators and "stand-up" air pipes—not to speak of wire rope winches and mooring bollards—placed right in the fairway of clear decks, and dead in the passageway of access from forward to aft or *vice versa*. Such obstructions are indefensible from any point of view, and can only be excused on the ground of lack of thought on the junior draughtsman's part, or inattention on the surveyors' or superintendent's part.

VENTILATION.—I think one could write a paper to itself on this interesting subject. To a steel structure such as a ship, plying as it does upon water and subject to the damp of sea air and the sweat due to varying conditions of temperature, ventilation is most important and vital to a ship's structure. I will not refer here to Board of Trade rules and requirements on account of crew accommodation and the ventilation due to gaseous and other cargoes, but only as it concerns the ship herself. All unventilated spaces engender sweat and foul air, both of which are very detrimental to iron and steel, and the latter more particularly. Go down into unventilated lower peaks, lower bunkers, tank spaces under boilers, and the unventilated bilge spaces at sides of holds, and there you will see the abnormal deterioration, due to vitiated air and clammy unwholesome atmosphere. Paint seems to have little protective power in such spaces; nor does cement wash seem to be any more effective where the conditions are all in favour of decay, for iron and steel, like life itself, cannot withstand the ravages of unwholesome surroundings.

Water ballast tanks, and similar spaces subject to frequent flooding, do not come under my category in this respect, for fresh or sea water is in itself aerated, and carries and brings with itself freshness and life which does not seem to greatly affect steel and iron; as witness the life and little deterioration in the cellular double bottom tanks of a ship.

SAILS.—These have so far become a rarity on the modern ocean tramp steamer, and indeed, also on the faster lines, that the view seems general that they are of no use on self-propelled vessels. Yet, I think it is a pity they have so easily become more or less obsolete, for sails (when set), steady a ship a good deal, and any sea-going engineer will testify to the easement upon the engines when the "fore and afters" are set, with a good beam or following wind. When in ballast trim or "flying light," it is often a difficult matter to keep a *full* ship to a strong head wind, and the setting of a main sail has helped many a steamer to keep her course or successfully work away from a lee shore. On the whole, I think a suit of good sails should be retained as the equipment of a steamer.

STANDARDIZATION.—We are indebted to Lloyd's and the other classification societies' rules, for a comparative standard for a ship's hull of the ordinary mercantile class, as also for many of its details, but there is room for more of these, either as rules or as recommendations. For one cannot ignore the fact that such rules as are now embodied in classification scantlings, have become an established market commodity or factor; and an owner buys a new vessel, classed to such a standard, believing he (or they) is getting an all-round good thing. As illustrating my point, I would mention that prior to about 1902 there was no rule scantling for steering rods and chains, and in three vessels of over 7,000 D.W., built just prior to the rules now in force, the chains were $1\frac{1}{8}$ in. and the rods $1\frac{1}{2}$ in. These have all had to be renewed to as large a diameter as the quadrant grooves and chain leads would permit. The present rules require $1\frac{3}{8}''$ chains and $1\frac{5}{8}''$ rods for similar ships, showing conclusively that that a "standard" is not only desirable but necessary for the working details of a modern cargo ship; and the more such details are brought to an efficient and common denominator, the less will be the divergent quotations of respective builders upon the same general specification.

I venture to say, that if Lloyds', and other classification societies, issued a list of "recommended" extra scantlings, diameters, etc., as distinct from actual minimum requirements, that many owners would include "the recommendations" of such societies in their enquiries, and the outcome would undoubtedly be a better ship. Lloyd's and the others, now exercise so mighty an influence, and, I might say, a beneficent one, upon the structure of ocean-going craft, that the owner or purchaser of a single craft, or the foreigner (either or both very probably without a special technical adviser) are safe, in regard to the main structure, in purchasing to such a standard from any reputable builder; yet they are at present without due protection in regard to such important details as masts for cargo work, derricks and fittings for handling cargoes, minimum water ballast for unloaded conditions, and for the pipes in connection with same, and other items of convenience to the working of the ship.

CORRESPONDENCE.

We do not hold ourselves responsible for the opinions of our correspondents.

To the Editor, MARINE ENGINEER AND NAVAL ARCHITECT.

Dear Sir,—My friend, Mr. C. S. Bullock, sends me a cutting which states: "The engines of the first steamer that ever crossed the Atlantic have been recovered off the coast of Cork, after more than 50 years' immersion," and asks if I know of anyone who could tell him something about the whereabouts of this old engine. Mr. Bullock says: "If it is true that the engine of the *Sirius* or the *Gt. Western* is still in existence it would be worth a trip across the ocean to simply lay hands upon it and say 'Well done, thou first of a mighty fleet.' We had the engine of the *Savannah* for awhile in some of our exhibitions, but like the rest of the things that a Yankee can turn into money, this too has gone. Hoping that there may be among your circle of acquaintances and friends someone who can tell whether the story is true or not."

Yours faithfully, H. E. J. CROSIER.

Newcastle-on-Tyne, March 15th, 1909.

OBITUARY.

Captain Rutter, Hull.—The death took place on March 15th of one of the oldest and most respected captains in connection with the shipping life of Hull, Captain Rutter, He was for many years marine superintendent for Messrs. Wilson, but he retired some fifteen years ago. Deceased, who was nearing his 80th year, before joining Messrs. Wilson, was in the employ of Messrs. Brownlow, Lumsden & Co., who were engaged in the St. Petersburg and Hamburg trade until the business was taken over by Messrs. Wilson. He continued in the Baltic trade until he was appointed by Messrs. Wilson as their marine superintendent, in which office he continued for twenty-two years, until he retired in June, 1896. He obtained his command early in life, when he was not much over twenty-one years of age, and was highly esteemed in shipping circles at the Humber ports. He was also a valued member of the Hull Trinity House. In 1868 he became a Younger Brother, and assistant in 1879, and an Elder Brother in 1888. He served in the office of warden on several occasions.

THORN'S SCHOOL OF MARINE ENGINEERING.—At the examination held in London last January, for Board of Trade surveyor, the candidate placed *first* on the list of successful applicants was Mr. L. Parker, of Leeds, who was prepared by Messrs. W. H. Thorn & Son, 5, Waterville Terrace, North Shields, who have now passed thirty-one surveyors and 182 extra chiefs.

Some important changes have, it is announced, just been carried out in the management of the Palmer Company's yard, involving the promotion of Mr. Malcolm Dillon to the position of local director, and the appointment of Mr. A. B. Cowan, of Glasgow, to the position of general manager. Confident expectations are entertained that under the new *régime* business will be stimulated in the early future.

THE "BOLTLESS" IMPROVED BOILER FURNACE FRONT.

THE Patent "Boltless" Furnace Front, shown in the adjoining illustration, has been designed with a view to eliminating certain sources of trouble and expenditure in connection with furnace fronts. We understand that 300 of these improved fronts have been fitted in a little over a year, which affords satisfactory proof that their advantages are appreciated, and as it is stated that no maintenance charges have been incurred during the past eighteen months, the record appears to be satisfactory.

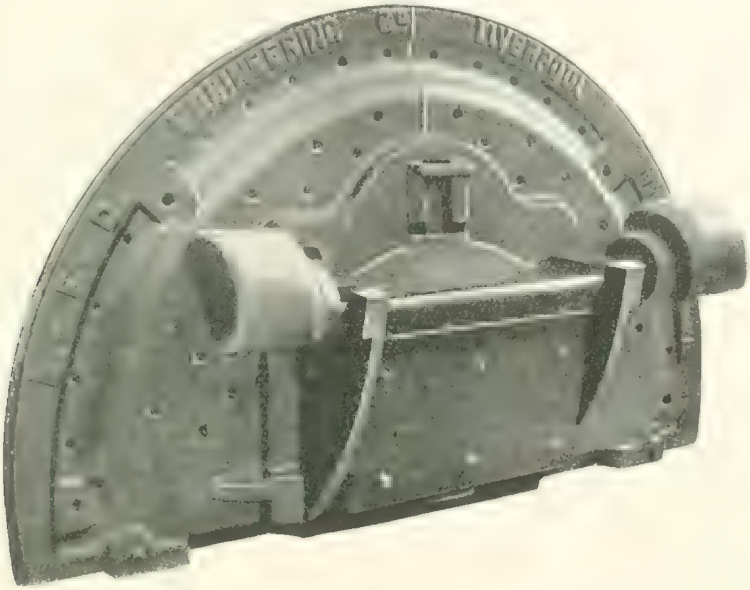
In developing the arrangement the following features have been aimed at:—1st, the production of a front which can be kept in working order without recourse to skilled labour; 2nd, modifications on existing practice, which will obviate failure due to unequal expansion and contraction; and 3rd, existing fronts are easily utilized.

The first feature has been successfully obtained by arranging the front plate, door frame and flame plates so that they can be assembled in place without tools of any kind, the simplicity of the arrangement making it possible for a labourer or fireman to take down or erect any of the parts in a few minutes.

The second feature has been secured by dividing the front plate vertically and avoiding the use of bolts. These simple expedients remove liability to failure through unequal expansion and contraction, and leave the front free to come and go, as the temperature alternates.

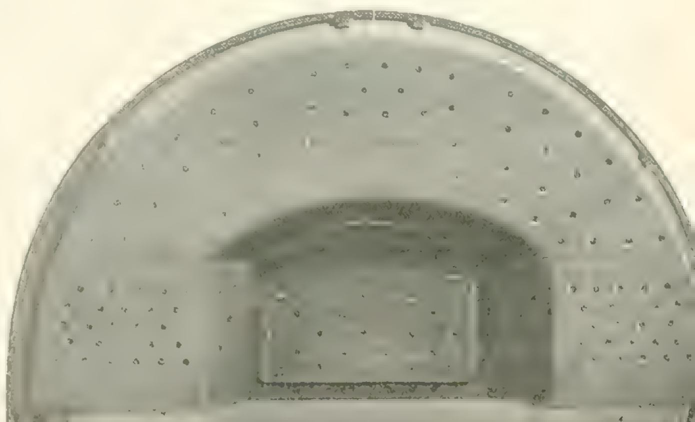
The third feature is that no alteration on existing arrangements is necessary, as the frames and doors can easily be fitted to the present fronts if the latter are in good order.

It is reasonable to assume that any improvements which bring about a diminution in renewal and maintenance charges are certain to meet with the approval of shipowners and engineers, and on this basis we have pleasure in calling attention to the special features of these furnace fronts, which can also be used for forced draught in closed stokeholds.



These fronts cost little more than the ordinary one, and from information received after twelve months' active service across the Atlantic, the upkeep has been *nil*, while the ordinary door costs about 15/- for repairs every time the vessel arrives at the home port.

Among the steamers on which these fronts have been installed are the following Atlantic liners:—*Adriatic*, *Baltic*, *Oceanic*, *Delphic*, *Bovic*, *Celtic*, *Çevic* (*Laurentic* and *Megantic* building), s.s. *Liverpool* and the I.O.M. t.s. *Viking*, and two new steamers building for H. & W. Nelson, Liverpool. Others have been supplied to Messrs. Harland & Wolff, Ltd., Cammell, Laird & Co., Ltd., A. J. Maginnis, C.E., Liverpool,



Philip & Son, Ltd., A. Richardson, C.E., The Lancashire Fisheries Committee, The Southern Engineering Co., Ltd., The Eastern Telegraph Co., Liverpool Screw Towing Co., D. Rollo & Sons, Liverpool, and we understand others are in use.

These fronts are put on the market by The "Economic" Forced Draught and Engineering Co., Ltd., of 5, Castle Street, Liverpool.

DOUST'S EXPANSION JOINT.

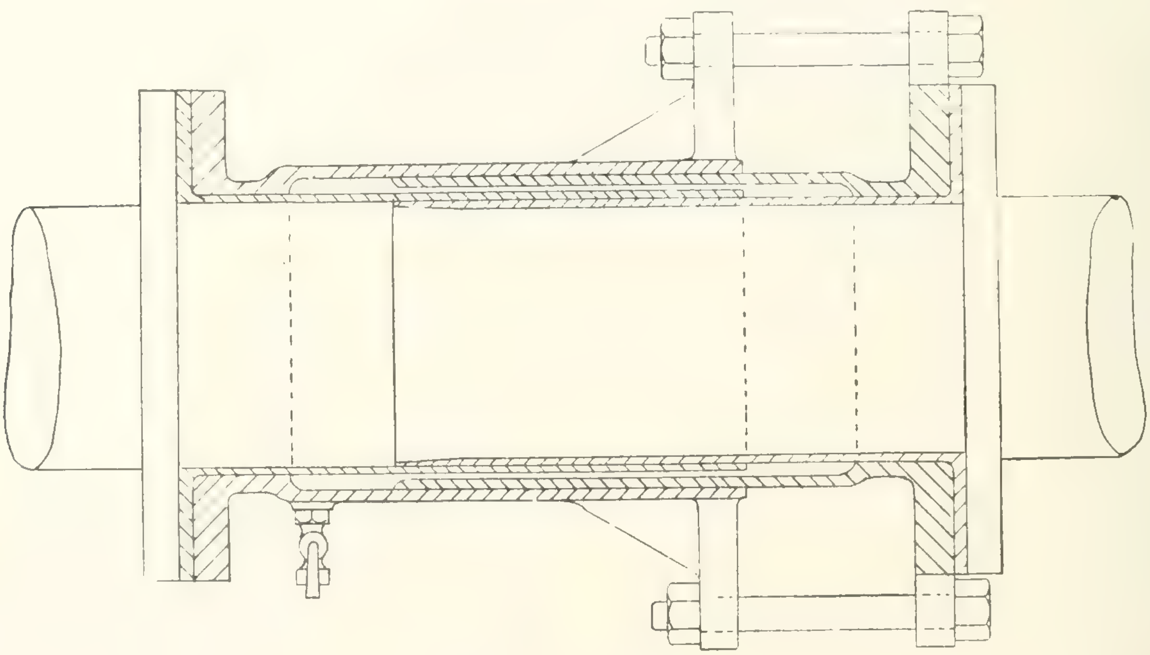
It will be generally recognised that the increasing pressures and temperatures of modern steam practice have created a real demand for more reliable means of dealing with the expansion and contraction in steam piping. Many of the present forms of expansion joints have to depend upon the efficiency of packing, but owing to the want of certainty of free and unimpeded action such efficiency is often impaired.

In our February issue we gave an interesting paper, read by Mr. W. R. Austin before the Greenock Institution of Engineers and Shipbuilders on December 10th, 1908, in which he referred in appreciative terms to the Doust expansion joint, and we propose to place the same before our readers.

The joint is illustrated in section in the adjoining diagram and is composed entirely of gun-metal, being therefore much lighter than the ordinary cast-iron bushed joint with gland and packing.

The construction of the device comprises two outer and inner bushes, provided with flanges on the ends, which abut against the pipes' flanges, and are secured thereto by bolts passing through the flanges. These parts, being machined, can freely telescope with one another on any expansion or contraction taking place. In order to provide means for preventing the joint blowing apart, safety bolts and lugs are arranged to prevent any abnormal telescoping effect. A drain-cock is fitted to remove any water which may accumulate by condensation. This joint, by possessing no gland or packing liable to bind in any way, has a flexibility hitherto unattainable by any sliding expansion joint, while its construction in gun-metal renders it free from liability to corrosion, as cast-iron is, particularly in exposed positions, such as are occupied by ships deck steam-supply pipes.

These expansion joints are put on the market by Messrs. Hannams, Ltd., of 4, Monument Street, London, E.C.



Doust's Expansion Joint.

We understand that at present Mr. Edward Hayes, of Watling Works, Stoney Stratford, has under construction the following craft: A steel tug 48 ft. long by 11 ft. beam and 4 ft. draught, fitted with a set of "Hayes" standard compound surface-condensing engines of special design for tropical work, giving about 75 I.H.P. Boiler for same of the marine return-tube type has been constructed under Lloyd's survey for 120 lbs. W.P. A spacious cabin is fitted forward and there is a crew space aft fitted with seats. Ample head-room has been provided by a long steel casing. She is practically a sister boat to the Admiralty tug supplied last summer. Her specified speed is 11 miles. A steel launch 60 ft. long, 11 ft. beam and 2 ft. 9 in. draught, having twin screws, each being driven by a compound engine of 40 H.P.; both engines exhaust into a large separate condenser which is of special type, being self-contained and suited for work in hot climates. The whole plant will be about 100 I.H.P. There will be a large teak saloon fitted forward and a crew space aft. The speed will be about 11 miles, she is for shallow river work abroad. Two motor launches, one 35 ft. long, one 40 ft. long, each having four cylinder motors of about 40 B.H.P. Mr. Hayes is also erecting eleven sets of compound surface-condensing engines of marine type, varying from 35 to 100 B.H.P., for single or twin screws.

THE FLEETS OF THE MAIL LINES.

(From Our Own Correspondent.)

The Great Cunarders.

THE *Mauretania* has indeed repaid the money and care which was expended on her winter overhaul. On her February eastward trip, which ended on the 18th of that month, she won for herself the absolute record for a day's steaming, accomplishing to noon on Monday the 15th February a distance of no less than 671 nautical miles, this involving an average speed of 26·21 knots. The speed for the whole trip was also a record, being 25·55 knots, though, as the course was over the long track, she did not actually lower the record for time of passage. On her return voyage she lowered the record by twenty-five minutes, making the run in 4 days, 20 hours and 2 minutes, her mean speed being 25·28 knots. But the great feature of this trip was the run of 607 miles in the short eastward day to noon on the Saturday, the 27th February. This again is an absolute record. On her March voyage to the westward she again accomplished a day's run of 671 miles to show that it was by no lucky accident that she had achieved it on the previous crossing, though for the whole voyage both time and speed were slightly inferior to those of the previous vayage. On her March eastward passage the *Mauretania* again lowered all records. She did 609 miles for her best day and did the whole passage in 4 days, 18 hours and 35 minutes, the mean speed being 25·61 knots.

Certain candidates for representation in Parliament of Lancashire constituencies have been discussing at their political meetings the coal bill of the *Lusitania* and analysing it with a view to seeing how far the land owner and the stoker fare in regard to it. The true facts seem to be interesting. It is in reference to what is spoken of as " a ten-days' cruise "—which, of course, means a round trip across the Atlantic. This involves a consumption of 10,000 tons of coal. For handling this fuel in the bunkers and at the furnace mouths the firemen of the ship receive some £750. The point of discussion—which is of less interest to us—was that as against this sum the landowners obtain in royalties a matter of £400 for this weight of fuel extracted from their land.

Old Ships.

I mentioned in a recent issue that the depression in shipping matters had rendered it tolerably certain that a great many of the older craft could never again be profitable to their owners, and that a large contingent would at no remote date find their way to the shipbreakers' yard. The Chargeurs Réunis—which is the principal company in France to devote its attention to trade other than mail and high-class passenger traffic—is acting on the principle then expressed. Already they have disposed of five of their older vessels, these being the *Campana*, *Corsica*, *Colonia*, *Colombie* and *Concordia*. These vessels were all built about twenty years ago, and most, if not all of them, came from the yard of the Loire Shipbuilding Co., at St. Nazaire. One of the quintet, the *Corsica*, having been purchased by Messrs. J. J. King and Sons, of Garston, was despatched from her home port to the Mersey, and had an exciting experience. for, encountering heavy weather, her pumps choked, and she had eventually to take refuge in Holyhead harbour.

American Steam Tonnage.

The results of the peculiar shipping laws of the United States are clearly distinguishable in the statistics recently published in New York with regard to the tonnage controlled by American citizens, but employed under foreign flags. The great organization in this matter is, of course, Mr. Morgan's Combine—The International Mercantile Marine, Ltd. It controls 1,100,000 tons of shipping under the nominal ownership of ten subsidiary companies. The most important of these is the White Star Line, whose total tonnage (including that of the two 45,000 ton monsters now building at Belfast) is 512,340 tons gross register, in thirty-seven bottoms. It should, however, be remarked that certain of these vessels are not wholly owned by the White Star Company, several of the steamers of the New Zealand service enumerated in the list being partly the property of the Shaw Savill and Albion Line. Next in tonnage comes the Leyland Line, which totals 221,772 tons. These vessels, being, of course, much smaller than the White Star Liners, it requires some thirty-eight bottoms to comprise the tonnage of the fleet. The Atlantic Transport Company is credited with thirteen steamers of a total of 99,505 tons, whilst one of its ancillary companies, the Atlantic Transport Company, of West Virginia, has under European flags two ships of 17,623 tons, and the other, the old National Steamship Company, still retains nominal ownership of two eight thousand ton cargo vessels. Turning to the other linked companies we find the Dominion Line with three vessels of 18,246 tons and the British and North Atlantic Steam Navigation Company eleven of 70,762 tons. The Red Star Line has five twelve-thousand ton twin-screw liners under the Belgian flag, whilst the International Navigation Company, which works in conjunction with it, has six vessels of 58,145 tons. Finally we have the Wilson and Furness-Leyland Line with a fleet of five steamers aggregating 27,352 tons gross register. Other corporations are the Standard Oil Company, with 187,834 tons—much of which, however, is in ocean barges—the United Fruit Company with 64,800 tons, the Hogan Line with 37,321 tons, the New York and Pacific Line with 33,326 tons, the Norfolk and North American Company with 30,525 tons, the New York and Cuba Mail Line with 21,752 tons, and the New York and Oriental Steamship Company with over 17,000 tons. Besides these there are one or two less important lines controlled by American capital, and it is said a large tonnage of nominally European steamships is doing American trade under lengthy time charters. The most remarkable feature of the whole statement seems to be the large and rapid increase in the fleet of the Standard Oil Company. It is alleged that three-quarters of the capital of Mr. Morgan's enterprise is held in the United States, but, as Mr. Commissioner Chamberlain—who puts forward the statement—truly says in his report, there is no possibility of arriving at the true proportion and the statement must be more or less of a guess.

The Hamburg-American Line.

The depression in shipping, which has been so notable a feature of recent times, has naturally made its mark on the working of the great German company whose activities extend into practically every corner of the world. It caused little surprise, therefore, when it became known that there would be no dividend for the year 1908. The zenith of the company's prosperity seems to have been reached about the year 1905, when it was feeling the benefit of the charters which its directors obtained in connection with the voyage of the Baltic Armada, and it otherwise had the advantage of the war in the Far East. Next year there was a slight falling off—the distribution being at the rate of ten per cent. per annum. Last year showed a more marked decline, though even then a fair return—one of six per cent.—was made to the shareholders. But in respect of 1908 there is nothing. The gross profits for 1908 are exactly half those of 1906, being about £800,000 as against £1,600,000 two years previously. Of this gross profit some £150,000 is absorbed in charges on debentures and such like, whilst £650,000 is carried to depreciation and reserve. It should however, be explained that under the arrangement by which a sort of equalization-of-dividend-fund has been constituted between each of the two great German companies and the Morgan Combine, there will in respect of 1908, be something substantial payable to the Hamburg-American Line. This sum is not reckoned in the gross profit and it will, in fact, not be brought into the account, being carried forward for the benefit of 1909. The current year, therefore, takes some £80,000 which should really have gone to its predecessor. The debenture charges, on the other hand, will apparently be higher in future than they have been in the past, as during the year a new debenture loan of a million and a half sterling has been carried through. The business of the company is, indeed, a gigantic one. The total tonnage of the fleet is placed at 915,855 tons, which is, of course, far in excess of that owned by any other single shipping company. Even the Combine only totals, say, 1,102,697 tons under European flags, though to this must be added the ships of the American Line, flying the stars and stripes. They probably add another

50,000 tons to its total. The ocean-going ships of the Hamburg Line made some 985 voyages during the year and carried 280,404 passengers, as well as five and a half million tons of goods, travelling not far short of seven millions of miles, a distance equivalent to 318 voyages round the earth at its greatest circumference. All this has been done without the loss of a single vessel. Three of the older craft have, however, been sold out of the fleet, whilst the provisional orders given for certain new vessels, contemplated just before the break up in American financial circles, were cancelled. Thus the ship which was to have been a sister to the *Amerika* will not —at all events at present—see the light. There were, of course, some vessels with whose construction too great progress had been made at the time of the crisis for it to be possible—or at all events advisable—to cancel the contracts. Five of these have already been delivered and got to work and now there remain the important New York liners *Cleveland* and *Cincinnati* to be delivered. Both will, it is anticipated, be on their stations by the month of May. Then there will be a period of rest and strengthening of resources for the Line. I should add that the figures of traffic which I have given do not refer to the local trade of the company's ships. This is being considerably increased, especially in regard to the excursion trade from Hamburg, which extends not only to neighbouring places of interest, but which embraces trips to the Rhine.

Legal Decisions.

Judgment was given early in March by the Court of Inquiry appointed to investigate the circumstances surrounding the disappearance of the Great Eastern Railway Company's twin-screw cargo steamer *Yarmouth*, which, as it will be remembered, was lost on her voyage from Rotterdam and the Hook of Holland to Harwich on the 27th October, 1908. The court found that the total weight of cargo shipped aboard her was 431 tons on this fatal voyage, and that part of the cargo which was carried in the lower holds and 'tween decks was properly stowed. But fault was found with the practice, followed on this as on other occasions, of carrying part of the goods on the poop and forecastle, especially when, as seems to have been the case, there was no sufficient evidence that the three furniture vans borne so high in the ship were secured by proper lashings. The ship was well found in every respect, and as designed she would be absolutely stable. The court, however, was of opinion that a serious error of judgment had been committed by those who sanctioned the practice of carrying cargo on the forecastle and poop and, of course, this will never again be risked.

I understand that there is to be held in this country an inquiry by order of the Board of Trade for the purpose of inquiring into the circumstances surrounding the loss of the Ellerman liner *Sardinia* by fire at Malta, with regrettable loss of life. It may be remembered that a Naval Court sat to deal with the matter locally and that there were passed certain strictures upon those concerned by a naval officer who sat as nautical assessor to that court. The formal report of the proceedings, together with the findings sent home by it, have now been published by the Board of Trade, and some dissatisfaction with the result has been expressed in the quarters affected by it, so the matter is to be re-opened. As far as I can see the outbreak of fire was so sudden, and the rapidity with which the conflagration spread so unprecedented, that anything that may be said is more or less a counsel of perfection. There was little or no chance to use the appliances with which the ship was fitted and no one was able to realize—or could have been expected to realize—when the fire was noticed that in a few minutes it would assume such terrible and uncontrollable dimensions. The occurrence may, however, be the means of opening the eyes of those connected with such matters to the dangers attending the carriage of certain goods as cargo, and it may suggest precautions to be taken to prevent goods which are liable to spontaneous combustion or which give off dangerous gases from being shipped under false descriptions.

The Loss of the "Republic."

The twin-screw liner *Florida*, which was the vessel which sank the White Star Liner *Republic* off Fire Island, at the end of January, has now been sold by her owners, the Italian Florio Rubattino Line. She was put up in her damaged condition at New York and fetched £44,100 at the auction. It is said that it will cost from £12,000 to £14,000 to put her in repair again. Her original cost was £70,000. As she is but four or five years old, the price realized was probably satisfactory to both parties, for, judging from the cost of shipbuilding in the United States, it is certain that a vessel of her character is cheap at the price when delivered behind the rampart of tariffs, and the consequent high cost of labour. This sale, however, was not apparently completed, and the vessel is now reported as sold to the British firm of Messrs. C. T. Bowring & Co., for about £9,000 less than the price fetched at the auction.

Submarine Bells.

The Admiralty has published a list of submarine bells round our coasts. A dozen installations have already been made, and this total does not include the bell of the Mersey Dock Board, off the entrance to the port of Liverpool. Moreover, it is stated, that two other stations are to be instituted in the near future at important points off our coasts, the one being at the South Stack, Holyhead, and the other at the Lizard.

The Late Captain Cameron.

It is with much regret that I chronicle the death, on the 14th March, at the age of fifty-eight, of Captain Cameron, who till about a month ago was the Marine Superintendent of the White Star Line, at Southampton, a position which he held from the time that the New York mail steamers of the Line left the port of Liverpool. He entered the service of the White Star Line as long ago as the year 1877, though at first he was in the sailing vessels of the fleet. His last command was the *Oceanic*, whose first captain he was in the days when she was a ship of phenomenal and unprecedented size. It may be interesting to add that the late Captain Cameron was a brother of Mr. Nelson Cameron, a partner in the firm of Messrs. C. W. Kellock & Co., and a gentleman whose knowledge of everything pertaining to the history of the shipping trade was unrivalled.

Institute of Marine Engineers.—The annual meeting was held on the 19th of March. We shall give a report of the meeting in our next issue.

The Schmidt Superheating Co., Ltd., have opened a technical office at 28, Victoria Street, S.W., for their marine superheater, and Mr. A. F. White, M.I.N.A., M.I.Mech.E., etc., has been appointed consulting engineer for the marine department.

The Slide Rule.—Engineers who use the slide rule, and daily their numbers increase, are probably unaware that the instrument was invented nearly three centuries ago. Gunter, shortly after bringing out his trigonometric logarithm tables, in 1620, placed logarithmic scales on wooden rules, using a pair of dividers to add and substruct the logarithms. Seven years later Wingate drew the scales on two separate wooden rules, sliding against each other, thus rendering the use of dividers unnecessary. In 1657 Partridge brought out the slide rule more or less in its present form.

Humber Graving Dock.—Registered with a capital of £150,000 in £10 shares, to construct or establish graving docks with patent and other slipways, grid-irons, shipbuilding yards, sheds, workshops, stores and other works and conveniences for the repairing and accommodation of shipping in or near the docks and works at Immingham, Lincolnshire, now in course of construction by the Humber Commercial Railway and Docks Company, pursuant to the powers conferred by the Humber Commercial Railway and Docks Acts, 1901, 1904 and 1908, or elsewhere. The signatories are :— J. Rostern, Prestwych, Northwood, assistant to railway manager ; T. C. Higgins, The Limes, Gladstone Road, Chesterfield, mineral manager to G.C.R. ; O. S. Holt, Gate House, Pinner, secretary, to G.C.R. ; W. H. Edge, High Street West, Rickmansworth, clerk ; R. H. Brown, 7, North Gate, Regent's Park, N.W., railway superintendent ; W. R. Mole, River Mede, Harpenden, assistant solicitor to G.C.R. ; E. Coleby, 81, Adelaide Road, West Ealing, clerk.

ELECTRICITY ON BOARD SHIP.

XXI.*

By Sydney F. Walker, R.N., M.I.E.E., Assoc.M.I.C.E., etc.

Methods of Supporting Electric Incandescent Lamps.

The method of supporting the lamp is as important as any other part of the apparatus. The lamp is from its nature, very fragile, though it is stronger than it looks, and has to be protected from being accidentally knocked by ropes, men's arms, heads, etc. On board ship, also, the problem involved in the support and protection of incandescent lamps is very much more difficult than on shore. On shore, electrical engineers at first followed gas engineers almost slavishly. Gas engineers had been obliged to employ pipes to carry the gas, and they had worked out numerous very pretty designs for concealing the pipes, and for holding shades and ornamental fittings, so as to get rid of the somewhat crude look of the ordinary gas burner. They were obliged also to turn the gas burner upwards, because it was then necessary for the gas to issue upwards. Electrical engineers, in the early days of electric lighting, adopted gaseliers, as they are called, and gas brackets, converted them to what they termed electroliers, by bending the arms which had supported the gas shades downwards. The result was anything but an artistic appearance, though it answered the purpose.

The first requirement of any support of an incandescent lamp is something to which the lamp holder can be screwed; and a pipe, similar to a gas pipe, that will carry the two wires bringing the current to the lamp, is the simplest arrangement that can be devised. The pipe may take any form that may be desired, and on shore, as explained, it has largely taken the form of two-light, and three-light fittings, branching from a central pipe and suspended by it from the ceiling, the wires coming from the floor above, through the central pipe, to a boss at its lower end, and thence branching to the arms. There is no room for this on board ship, except in the saloons, and there even it has apparently not found much

Fig. 1

Fig. 2

favour, owing to the danger of the whole thing being swept away, if anything strikes it when the ship is labouring in a heavy seaway. In the writer's view, something of the kind might be worked out for suspending over the dining tables, for instance, in the saloons of the large liners. If the fittings were made strong, and securely fixed to the beams overhead, they should answer very well. In the saloons of the modern liners the room between decks is such, and the saloons themselves are now so large, that fittings of this kind might very well be employed. The fittings, however, that have found more favour are those which are fixed either close to the ship's side or close to the beams. Ships side fittings for saloons, cabins, etc., usually consist of a short length of stout tube, bent at right angles, and carrying a disc at its end, arranged to support a shade which may be of an ornamental pattern. The tube is screwed to a brass disc, similar to those used with gas brackets, which is fixed against the woodwork of the ship's side, the wires entering the tube through a hole in the disc, and passing down through the tube to the lamp holder. The outer end of the tube either carries a small screwed nipple, something like a gas adapter, with which the lamp holder engages, or it is itself screwed on the inside, and a male screw on the lamp holder engages with it. The whole thing forms a very strong and serviceable fitting if properly made. The shade is held by a collar, arranged for the purpose, which clasps the lip of the shade between it and an indiarubber washer, the whole being held in position, either by screwing the collar into a screw on the end of the ring of the fitting, or by small screws. The better arrangement is by screwing the collar itself. Fig. 1 shows one form of this fitting with a wire guard outside the shade.

For lamps which are to be fixed under the beams, the disc which forms the end of the bracket fitting is either screwed

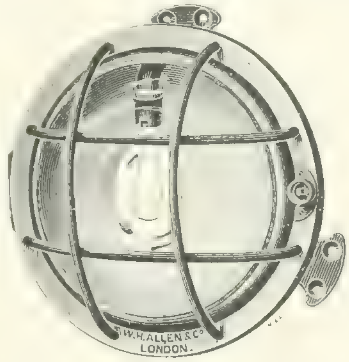


Fig. 3

directly to the beam, by wood screws, or there is a short neck of stout pipe between it and the beam. The lamp holder engages with a nipple in the centre, through which the leading wires are carried, the shade being held in position by a collar similar to that of the bracket lamp. Fig. 2 shows one of these fittings.

But in a great many parts of the ship there is not room, either for the beam lamp or the bracket lamp, and for those positions other methods have to be adopted, to protect the lamp and to arrange that its light is shown where required. For these situations bulkhead fittings have been designed. The bulkhead fittings are sometimes called oyster fittings, from their resemblance to an oyster, from which one shell has been removed. They are of two forms, arranged to throw the light on one side only, or on both sides. A single lamp may be arranged to light adjacent cabins for instance, if fixed in the bulkhead between them, or any two adjacent rooms such as stores, etc. For giving the light only in one direction, the fitting has a substantial disc from 6 in. upwards in diameter, with a hole and a nipple for the leading wires to come through, and for the lamp holder to engage with. The inside of the disc is sometimes dished, so as to give more room for the lamp, and is sometimes flat. Again, it is sometimes painted with white enamel, and sometimes has a back of enamelled iron. There is a circular concavo-convex glass to protect the lamp, held by a collar hinged to the disc, and secured to it on the other side by a wing nut or padlock, preferably the latter, in order that it may not be interfered with. Fig. 3 shows one of these.

For the bulkhead fittings giving light in two directions, there is a substantial ring, with a collar and glass on each side. The ring carries the nipple for the lamp holder, and the leading wires, and the two collars hold two concavo-convex glasses. It is important, in either form, that the lamp shall not touch either the protecting glass or any part of the fitting, except, of course, the lamp holder. As marine engineers know, in all these cases comparative freedom from breakage is obtained when the weak part of the apparatus, the lamp in this case, is perfectly clear of everything else, so that the jars produced by the working of the ship may not be transmitted to the glass of the lamp itself.

Lamps for Cargo Lights.

It was explained when describing arc lamps that they are employed for loading and discharging cargo, triced up to

* For Articles I. to XX., see previous issues.

any convenient spot where they will throw their light around. Arc lamps, however, are troublesome to look after, particularly where they are only used occasionally, as for cargo purposes, and in a great many ships groups of incandescent lamps have been employed for the purpose. The usual arrangement consists of an inverted metal basin, of enamelled iron, carrying lamp holders screwed to a boss on the inside, for three, four or more incandescent lamps, the front of the basin being protected by a wire guard, held to the basin in the same manner as the glasses are held on the bulkhead fittings. The boss for the lamp holders is screwed to a piece of pipe, passing through a hole in the centre of the basin, and arranged on the other side with an eye for a rope to trice up the whole fitting, and to carry the cable, bringing the current to the lamps. One form of the arrangement for bringing the cable in consists of an elbow piece, carrying the eye for the rope mentioned above, which is slipped over with a bayonet joint, or simply to plug in. The fixed coupling piece should have a cover provided to keep the wet out when it is not in use.

So far as the writer is aware, large incandescent lamps, 100 C.P. and upwards, have not been used for cargo lights, but in his view they would answer the purpose better than the groups of lamps just described. Lamps of 100 C.P. or upwards might be carried under inverted basins, protected by wire guards, just as the groups of lamps are, or in fittings similar to those described below, for ordinary portable lamps. It would be easy to rig up several of these lamps, in different parts of the ship, and on the discharging wharf, if there was not much light there, taking current by flexible wires from the ship. The lamps and their accessories should be less bulky, and should take up less room than the arrangements usually employed with groups of incandescent lamps. On the other hand, the use of small incandescent lamps has the

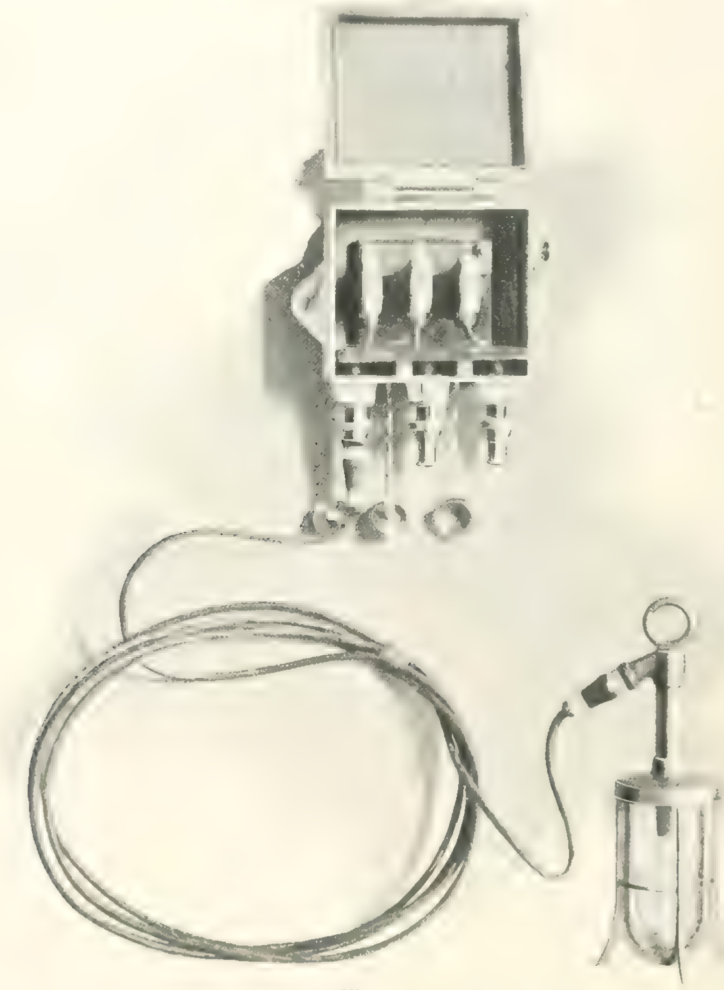
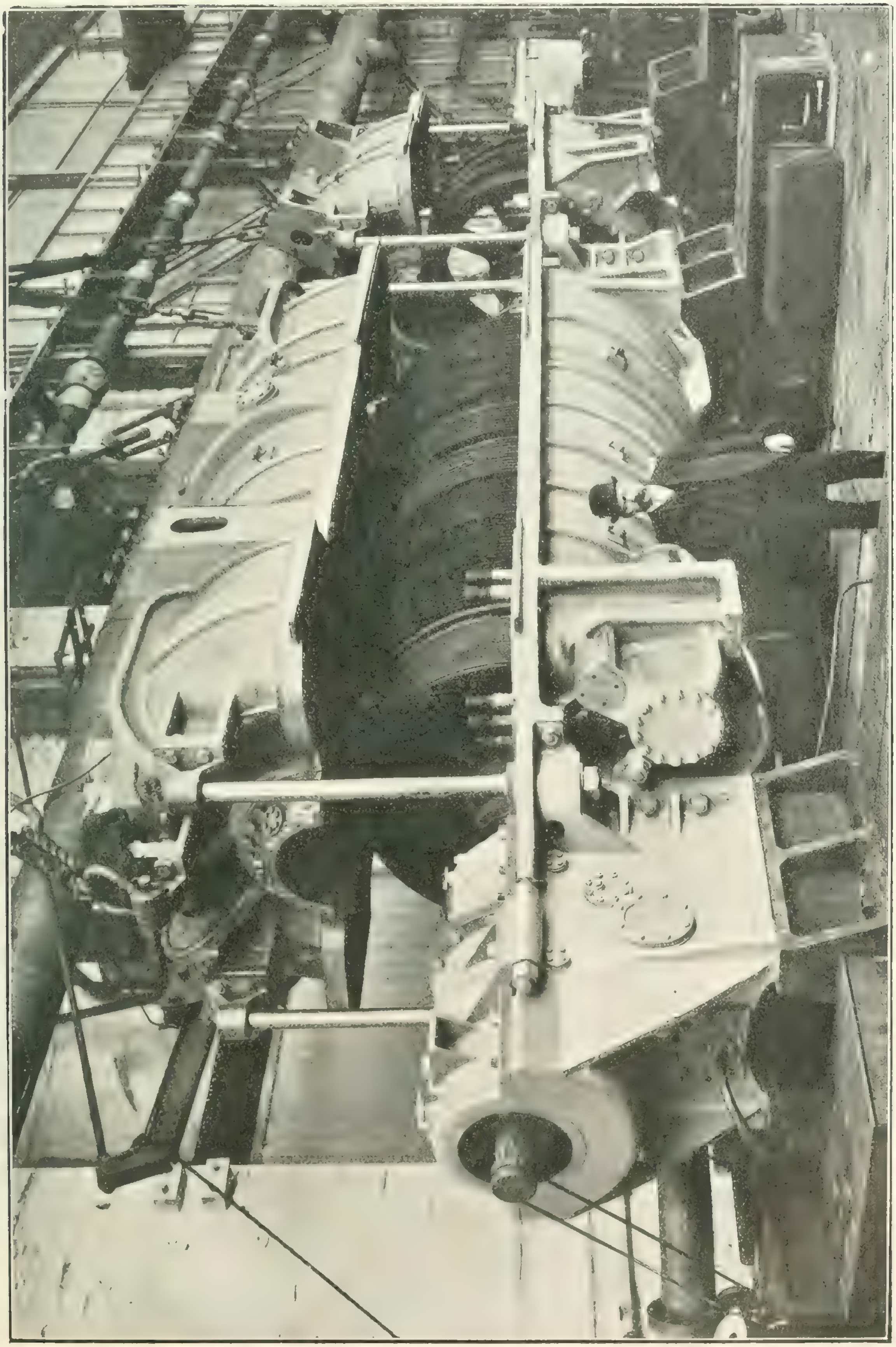


Fig. 4.

the top of the tube leading to the basin, and held there firmly, the flexible cable for the lamps being led in through the elbow to the main pipe. The boss inside the basin contains the joints of the connecting wires to the individual lamps. Current is obtained for the group of lamps from a coupling piece fixed in any convenient position in the ship's side or on a bulkhead. Cargo lights are usually supplied with current by twin flexible cable, which should be well protected with wrappings of jute yarn, tarred pretty frequently to keep the damp out. The end of the flexible cable carries a connecting piece, having two contacts attached to the two wires of the cable, and there are two contacts in the fixed coupling with which the contact pieces on the cable connector engage. The coupling piece may be arranged advantage that it does not necessitate the carrying of special lamps that are not often used, and that may be broken while in store. Further, there is always the possibility of not being able to obtain large incandescent lamps in foreign or colonial ports. Small incandescent lamps can always be purchased.

Portable Lamp Fittings.

One of the most convenient uses of the electric incandescent lamp is in a portable fitting, inside a boiler, for instance, or when repairing or cleaning any part of the plant where light is bad. The portable fitting usually employed is the same as that used on shore in mills and factories. It consists of the bracket fitting described above, but without that portion



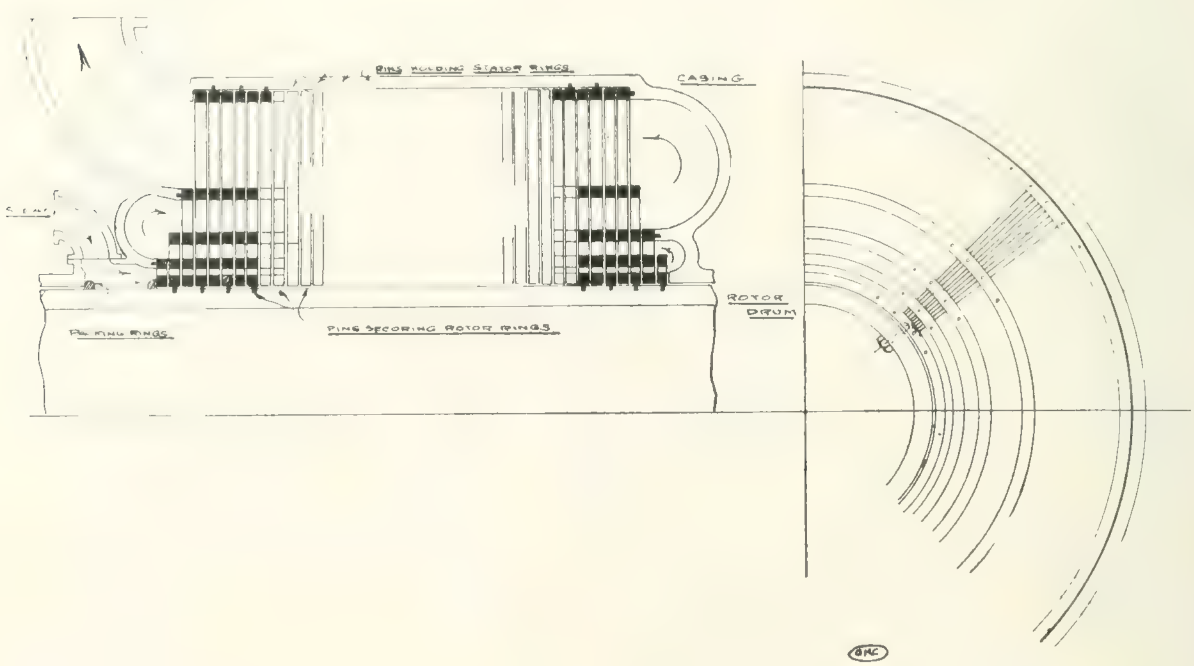
H.M.S. "Vanguard." Ahead and Astern Turbines.

A NEW TURBINE PRINCIPLE: REVERSIBILITY AND ABSENCE OF END THRUST.

A REVERSIBLE turbine has long been required, but to obtain this highly-desirable feature on the turbine of conventional type has been an impossibility. It was therefore with a considerable degree of interest that we recently examined the plans of a Glasgow inventor, Mr. William Clark, of Craigton, which provided for a turbine capable of reversal by simple means.

The Clark turbine is simple in principle, and its arrangement will be apparent from the drawings given. It will be seen that a number of rings are employed, stator and rotor alternately, carrying four concentric sets of blades, each set increasing in length as they get further from the shaft. The steam enters at one end and traverses the set next the shaft; it is turned at the opposite end and passes through the second ring, and so on till it passes by way of the exhaust to the condenser. Four expansion stages are thus provided, and reversing the direction of the steam ensures a balanced shaft with an absence of axial thrust. To reverse the direction of rotation of the shaft all that is necessary is to change the stator rings into rotor rings and *vice versa*. This is to be performed by a sliding mechanism on the casing and the shaft. By means of bars furnished with suitable projections and notches in the rings on their outer and inner circumference, it will be possible to lock them to either the casing or the shaft as required, the act of locking one set freeing the other.

The details of the turbine are covered by patents Nos. 16395 and 18550, dated February 1st, 1908, and it is hoped that it will be possible shortly to construct a model of several thousand horse-power to enable thorough trials to be made. The inventor has been engaged on experimental work in connection with turbines for some twelve years, and has already built some highly efficient examples, but as they did not lend themselves to reversing they were not further developed.



The Clark Turbine.

Section showing arrangement of rings and path taken by steam through the stator and rotor rings. For clearness the reversing mechanism has been omitted.

In addition to the advantages mentioned, the Clark turbine should occupy considerably less space than most existing examples of the axial flow type, while the outer exposed surface being small, a gain in efficiency should result from the small loss by radiation. The method of fitting the blades, too, which are to be of phosphor-bronze, is a mechanical one, and lends itself to economical production. The shortness of the shaft also calls for no special provision for expansion or for sagging of the drum.

Further developments in this promising invention will, we feel sure, be awaited with interest.

NAVAL MATTERS—PAST AND PROSPECTIVE.

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Sheerness Dockyard.

SHEERNESS does not figure very prominently in the programme of work contained in the Estimates, but this is usually the case. The two biggest jobs are the refits of the torpedo gunboat *Dryad*, the navigation school ship at Portsmouth, for which £17,030 has been allocated, £7000 being for wages, and the torpedo gunboat *Hazard*, which is at present a depot ship for submarines at Portsmouth. The refit of the latter vessel is put down at £19,327, £8000 of which will go in wages. There will be, of course, the usual periodical refits of destroyers and submarines. The Home Fleet concluded its cruise on March 11th. All the battleships and cruisers of the three divisions assembled off the Outer Gabbard on March 1st previous to going north. The battleships under Rear-Admiral Briggs, accompanied by the cruiser *Indomitable*, previously went for a week's cruise, using Margate and Deal as anchorages. Shortly after the vessels left information was received by wireless from the *Indomitable* that about £2700 had been stolen from her money chest, £500 being in £5 Bank of England notes and the remainder in gold. An investigation was held, but up to the time of writing no discovery has been made of the culprit. The Home Fleet is now been converted into what will be the strongest fleet in the world, comprising, as it will, thirty-six battleships and about the same number of cruisers, 150 destroyers and torpedo boats, thirty-two submarines and about forty other vessels. Admiral Sir William May took over the command from Vice-Admiral Sir Francis Bridgeman on March 24th, and has as his flagship the *Dreadnought*. Vice-Admiral Neville has taken over the command of all the nucleus crew vessels, which form the Third and Fourth Divisions of the Fleet, and he will fly his flag in the battleship *Magnificent*, but it is understood that he will have as his official residence Admiralty House. This was built as a nautical palace for King William IV., and was the official residence for a long series of years of the Commander-in-Chief at the Nore before the head-quarters of the Nore command were transferred to Chatham. Admiralty House has been lately occupied by Sir Francis Bridgeman. Mr. White, the late senior telegraphist in the offices at Admiralty House, has just been presented with the Imperial Service medal. He served for over forty-two years, and had seen no fewer than twenty-three commanders-in-chief in residence there. The First Cruiser Squadron in the reconstituted fleet will be the most powerful cruiser squadron afloat, consisting of the *Inflexible*, *Invincible*, *Indomitable* and *Minotaur*, with the *Drake* as flagship. It is quite fitting that such vessels should form the premier squadron of the Navy. The old Fifth Cruiser Squadron has been renamed the Second. The battleship *Vengeance* arrived from Portsmouth on March 1st. The previous afternoon during a heavy snowstorm the vessel, when steaming up the Thames channel towards the Nore, got out of her course and went aground on a sandbank. She was ashore for about three hours, but floated off without assistance and anchored for the night. She has since gone up to Chatham to be commissioned as parent ship of the special service division of battleships which is to be stationed in the Medway. Twenty out of the twenty-four destroyers of the Eastern Group—now the First Destroyer Flotilla—took part in the exercises of the Home Fleet, the other four vessels being in dockyard hands refitting, the *Exe* at Chatham and the *Boyne*, *Ness* and *Nith* here. The new ocean-going destroyers are now all equipped with wireless. The *Panther* has rejoined the Flotilla until relieved by the ocean-going destroyer *Saracen*, which will shortly be delivered by Messrs. White and Company. The torpedo gunboat *Leda*, which does duty under the Admiral commanding the Coastguard and Reserves, has come in for a refit which will include a wireless installation. On March 11th submarines "C 1," "C 3," and "C 4" came in from Harwich for a refit, and a week later "C 2," "C 5" and "C 6" left to rejoin the flotilla at that port. The cruiser *Pomone*, which was launched at this yard just over ten years ago, and which has been berthed for the past three years in the river Stour, is to be brought forward for further service, and for this purpose has been taken to Chatham. She was the last cruiser built here, and her sister cruisers, the *Pelorus* and *Proserpine*, which preceded her on the slip, are still in commission. The sloop *Espiegle*, which the *Pomone* is to relieve at Dartmouth, was also built at this yard, having been laid down after the *Pomone* was launched.

Portsmouth Dockyard.

Our share of work for the coming year, as set forth in the Estimates, is quite satisfactory. There is a "New Ship No. 1," on which £268,234 is to be expended, but everything else about the vessel is a mystery. The *Neptune* is to absorb £593,771 and the *St. Vincent* £316,646, while the refits of the battleship *Prince George* and the cruisers *Good Hope*, *Argonaut* and *Sappho* and the torpedo gunboat *Antelope* total up to about £170,000. For new construction and refits the sum of £307,460 will be for labour. The battleship *Bellerophon* which, as stated last month, was commissioned on February 20th, left a week later to join the flag of the Commander-in-Chief of the Home Fleet off Margate. The Commander-in-Chief at this port, Admiral Sir Arthur Fanshawe, made a general signal in which he said that the fact that the vessel was ready for service and able to take part in the exercises of the Home Fleet reflected much credit upon the officers and men, both of the Navy and the dockyard. The Admiral made another congratulatory signal to the battleship *King Edward VII.*, the flagship of the Channel Fleet, which established a record for coaling at the port on March 2nd by taking in from alongside the floating coal depot 1451 tons of coal in three and a half hours, the work being done by the ship's company. A week later the vessel, with Admiral Lord Charles Beresford on board, proceeded to Portland to join the Channel Fleet for its final cruise. Lord Charles has now retired from the command and the Channel Fleet is a division of the Home Fleet. The cruiser *Terrible*, which was taken in hand in April last, and the cruiser *Berwick*, which has been in hand since August, are to be completed by the end of March. The destroyer *Doon*, of the Channel Fleet flotilla, came in on March 3rd with her bows smashed. She and the *Fawn* left Portland the previous day for Dover to escort His Majesty's yacht *Alexandra*, with the King on board, to Calais. During the night, when sixteen miles east by south of the Owers lightship, the *Doon* came into collision with the steam trawler *Halcyon*, of Folkestone, which vessel sank, the crew being rescued and brought here by the destroyer. Three days later submarine "A 12," when entering the harbour after carrying out exercises in the Solent, went ashore on a mudbank, where she remained for some hours. She was, however, floated off with the rising tide none the worse. Vice-Admiral Robinson, the Admiral-Superintendent, will shortly be leaving us, and it is announced that Rear-Admiral Tate, who was formerly captain of the yard and deputy superintendent, will be his successor. The *Dreadnought* was completed while Admiral Tate was here and as Admiral-Superintendent he would take up his duties with the advantage of being thoroughly conversant with the yard. Admiral Robinson presided at the annual smoking concert of the officers of the yard, held recently in the Mould Loft, which was effectively decorated. In proposing the health of the Admiral-Superintendent, Engineer Rear-Admiral Corner gave a very humorous description of his experiences of dockyard life during his forty-four years' service in the Navy. The disaster to the cruiser *Gladiator* does not appear to have spoilt the career of her captain, as happens in many cases, Captain Lumsden having been appointed Director of the Royal Indian Marine.

Devonport Dockyard.

The keel plate of the new cruiser *Indefatigable* was formally laid on February 23rd by Mrs. Cross, the wife of the Admiral-Superintendent. The vessel, which is to be launched in October, will be 570 feet in length, 80 feet beam, of 45,000 horse-power and 18,000 tons displacement, with a speed of 25 knots. She will be armed as the other ships of the *Invincible* class, and will be the heaviest armoured cruiser afloat. To permit of her being laid down it was, as has been previously stated, necessary to lengthen by 90 feet our most modern building slip which was only completed five years ago. On this slip there have been built the cruiser *Minotaur*

and the battleships *Téméraire* and *Collingwood*. The extension has been carried out by the Works Department. The steam trials of the *Téméraire* have been completed, both the power and the speed desired having been exceeded, while the boilers easily supplied the steam required. The vessel has now been prepared for her gunnery trials, which will shortly take place. The *Téméraire* was laid down in January, 1907, and it was expected that she will be ready for commissioning about the end of May. It will, therefore, be five months over the two years before she is ready for the pennant. Of the four new vessels allowed for in the Estimates we are of course, to have one and the sum of £267,767 is allocated for her during the financial year commencing on April 1st. The refit of the cruiser *Niobe*, as the result of the supplementary grant, has been completed a little earlier than was expected. It has been of a most thorough character and the vessel should continue to be a most useful ship for several years to come. The cruiser *Doris* is to have her refit completed by the end of March. Other vessels expected to come in immediately are the battleship *Hibernia* and the cruisers *Argyll* and *Talbot*. The refits allowed for in the Estimates are the cruiser *Highflyer*, £43,338; the sloop *Espiegle*, £15,012; and the torpedo gunboat *Hebe*, £19,287. The cruiser *Hogue* has been taken in hand for a refit, which is estimated at £43,492, which will include new fire-control equipment, the installation of magazine cooling appliances and wireless. Her engines and boilers will also have a thorough overhaul. One of our special service vessels, the cruiser *Æolus*, has been taken to Haulbowline to be refitted at a cost of £20,000, and the navigating party are to bring back the cruiser *Media*, which has undergone an extensive refit at the Irish Yard. The *Medea* will be commissioned as a special service vessel for the local division of the Home Fleet. The cruiser *Pelorus* is expected from the Cape of Good Hope station early in April to pay off, when she will be taken in hand for a refit at a cost of over £22,000. Relieved at St. Helena in November by the *Pandora*, the *Pelorus* proceeded to South America and, after calling at various ports, ascended the Amazon as far as Iquitos, in Peru, about 2500 miles up the river. This is a most unique voyage for a cruiser of 2150 tons. Several of the destroyers of the Channel Fleet are in hand, among them the *Arab* and *Arun*, which recently came into collision, and the *Mermaid*, two of whose funnels have had to be hoisted out, having been affected by heat erosion near the base. The *Express* is also expected, having sustained some damage by running at night upon the Portland breakwater. The two destroyers recently purchased by the Admiralty from Messrs. Palmer are expected here before the end of March to be commissioned. They have been named the *Albacore* and *Bonetta*.

Pembroke Dockyard.

We have been well provided for in the programme of work for the new financial year. Two unarmoured cruisers are to be laid down, described in the Estimates as "New Ships No. 1 and No. 2," but no details are available beyond the fact that £177,762 is allowed for the former and £112,999 for the latter, the amount for labour being £48,610 and £23,700 respectively. For the *Boadicea's* completion £22,995 has been put down, £4500 for labour, and for the cruiser *Bellona* £114,011 is allowed, £37,300 being for dockyard labour. The *Bellona* was launched with all due ceremony on March 20th, the vessel being named by Lady St. Davids. Preparations for laying down another ship are in progress, and it is said that some of the material for her construction has already been delivered. The preliminary steam trial of the cruiser *Boadicea* was quite successful and the turbines worked splendidly. It is understood that she is to be fitted as a flagship and should this be the case it will necessitate additional cabin accommodation. The vessel will probably be ready for commissioning in June, which will be about three months after the date provisionally fixed. Afterwards it is expected that she will first proceed on an experimental cruise. The Admiralty have decided to have a flotilla of ocean-going destroyers at Milford Haven, a development of this character having been agitated for several years past. During his recent visit the Controller of the Navy inspected the machinery equipment of the yard with a view to having it adapted for the refits of destroyers, of which after the establishment of the base, we shall, of course, have a considerable number. Suitable additions to the equipment have been decided on, and some new machines have already arrived. It is understood that the Admiralty also have under consideration various improvements, and the construction of a large floating basin and dry dock is spoken of, as also the erection of a large storehouse. The refit of the destroyer *Violet* is being proceeded with, the reports as to her bad condition having been somewhat exaggerated, and she is to be ready by May. The refit of the torpedo gunboat *Halcyon*, which included a wireless installation, is nearly completed. The torpedo gunboat *Spanker* left to resume her duties under the Admiral commanding the Coastguard and Reserves on March 1st; her refit was somewhat protracted in consequence of a supplementary list of defects. Efforts are being made to complete the camels for use at Dover before the end of March, which will also be the end of the financial year. The work on the booms for the torpedo net defence of Portland Harbour is also being pushed on with a view to the same object.

Chatham Dockyard.

It appears to be practically certain that Chatham will never again be a building yard for anything but submarines, tugs and lighters, those being the only class of vessels with which we are provided in the programme of work for next year. We, however, must not grumble, for we have been allotted the lion's share of the repairing work, the large refits being put down at £324,541, over half of which will go in wages. Our repair work is making considerable progress. The battleship *Formidable*, which was taken in hand at the end of August, is to be ready by the end of March to relieve the *London* in the Channel Fleet, or, as it will be by that time, a division of the Home Fleet. The *London* will then be taken in hand for a similar purpose. The machinery of the *Formidable* has been thoroughly overhauled and she has successfully carried out her steam trials. The cruiser *Diadem* is also to be out of hand by the end of the month. Another large vessel in hand is the battleship *Venerable*, which was taken in hand last month on being paid off from the Channel Fleet. Then there are the cruisers *Andromache* and *Apollo*, which are being converted into mine layers, and the cruiser *St. George*, which is to be converted into a depot ship for destroyers. The vessels building are the tugs *Rover* and *Grappler* and four submarines, "C 17" to "C 20." The cruiser *Pomone*, too, has been towed round from the river Stour to be fitted for service as instructional ship at Dartmouth for the Royal Naval College at Dartmouth. Some interesting figures were quoted by Alderman Jenkins, M.P., in a speech recently, which show the condition of affairs in the yard during the last three years. In the first week of 1906 there were 7035 men employed, their wages being £8254, while for the week ending February 20th last the wages were £12,037 and the number of men employed 8819, this being an increase of nearly 2000 men and addition of nearly fifty per cent. to the wages bill. A member of the dockyard staff, Mr. G. Lewis, a chargeman of shipwrights, has been commended by the Admiralty and awarded £25 for inventing a machine for grinding crank pins in place during the refit of ship's machinery. The machine was made in the yard and its usefulness was recognised by the manager of the engineering department, Engineer Rear-Admiral Rudd. It has been tried on several vessels with most satisfactory results. The late Mr. Thomas Hooper, who has just died at the age of ninety, was doubtless the oldest surviving representative of the yard. He entered the yard in 1839 as an anchor smith and, becoming foreman of smiths, retired on pension in 1879. It is interesting to note that Mr. Hooper's son, who was foreman of the yard, is also a pensioner. Vice-Admiral Giffard, our Admiral-Superintendent, who came here in February, 1907, will, it is expected, shortly be leaving. It is understood that the new Admiral-Superintendent will be Rear-Admiral R. N. Ommanney, who was last year captain of Devonport Dockyard.

DREDGING PLANT FOR WEST AFRICA.—Messrs. Wm. Simons & Co., Ltd., Renfrew, have received an order from the British Government for a very powerful suction dredger, to be employed in the improvement of the port of Lagos, West Africa.

A NEW DESIGN OF STEAM ENGINE.

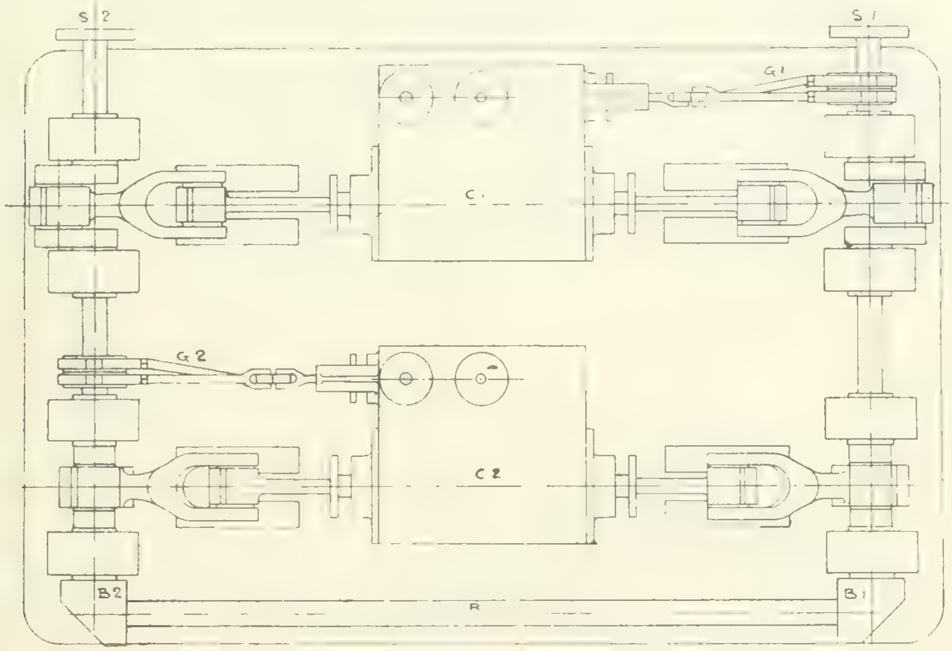
THERE has recently been tried at the Glasgow and West of Scotland Technical College, an engine which has some novel and interesting features. Its general construction will be better understood from the adjoining diagrams.

It will be seen that C1 and C2 are the cylinders, and each cylinder has two pistons, which drive the two side shafts, S1 and S2, by means of the piston and connecting rods in the usual way. G1 and G2 are the link-motions controlling the slide valves for the steam admission to the cylinders. R is a shaft connected to the crank shafts by means of suitable bevel gearing in boxes, B1 and B2, which prevents any alteration of the relative positions of the two crank shafts.

saving there can be is that there may be a small one in clearance volume, which could not amount to 20 per cent. Comparing the weight of this engine with an ordinary four-cylinder engine, the saving amounts to four cylinder covers, two sets of valve gears, two slide valves. None of these are heavy parts, and for cargo and passenger steamers the saving would not give a day's coal, even if the engine were suitable in every other way for this class of work.

As to space occupied, there is certainly a great decrease in height, but as an off-set to that the floor space is very much greater than that of an inverted marine engine.

There can be no saving in piston speed in an engine of this type over an inverted or any other type of four-cylinder engine, provided that the stroke of each cylinder and the revolutions are the same.



A New Design of Steam Engine.

The inventor, who is an Australian, claims that this engine is equally good for Marine or Locomotive work, that the fuel consumption is from 12 °/₀ to 20 °/₀ less, also that a saving of 50 °/₀ in weight and space occupied is effected over the ordinary reciprocating engine. The centre of gravity is low, and the engine is said to be specially quick in reversing. One of the most important claims made is that the engine is so balanced that there is no vibration, and owing to the connecting rod, R, if one propeller lifts the power is transferred entirely to one shaft and racing is minimised. It is also claimed that the propeller speed can be maintained at the same speed as with an ordinary engine, and that the piston speed is only one half.

On the matter of fuel consumption it may be said that as a piston engine there can be little difference between it and one of four cylinders, so that the only

There are several disadvantages which the horizontal engine has; for example, the cylinders tend to wear oval, and there is always the difficulty of keeping the pistons and the glands tight. There is the difficulty of overhauling the engine; indeed there is no use saying anything more on this point to marine engineers, as the horizontal engine has been discarded for many years, the Navy retaining it, with all its trouble, for some years longer than the Merchant Service, on account of its convenience in stowing away under the water line. Another objection to a horizontal engine is the difficulty of getting a connecting rod of a length which will not make the reaction force on the guide bars too great. In this particular design, if the connecting rod is made long the centres of the crank shafts are spread out so much that few ships, if any, would have the beam necessary to carry the engine.

AILSA CRAIG MOTORS.

At the Aero and Motor Boat Exhibition held at Olympia last month the Ailsa Craig Motor Co., of Strand-on-the-Green, Chiswick, exhibited some of their new enclosed paraffin and petrol marine motor outfits with various types of propellers, as well as a fine 35-feet motor launch suitable for river or sea work.

They exhibited a model yacht to demonstrate their new patent auxiliary motor device as fitted to Lord Ardee's cutter *Patience*, which is illustrated in Fig. 1, and should be of great interest to yachtsmen, as the device can be easily installed when afloat, leaving the sailing qualities of the vessel unimpaired.

Working models of engines to illustrate the "offset" cylinder design were also shown. It is claimed that the special features of this arrangement account for the remarkably silent and smooth running qualities of the Ailsa Craig motors by reason of the absence of side-thrust on the cylinder walls.

The enclosing of all the valve-operating mechanism in this year's models renders the engines even more silent and ensures cleanliness in the boat. All covers can be opened without removing any nuts—a feature which users will greatly appreciate.

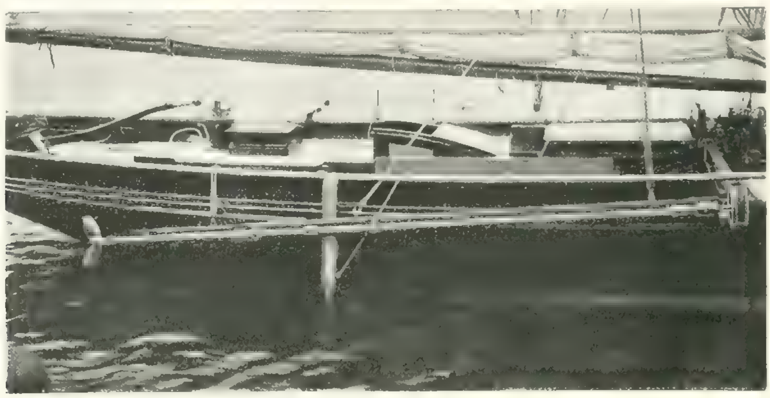


Fig. 1 -Lord Ardee's 22-ton Cutter Patience.

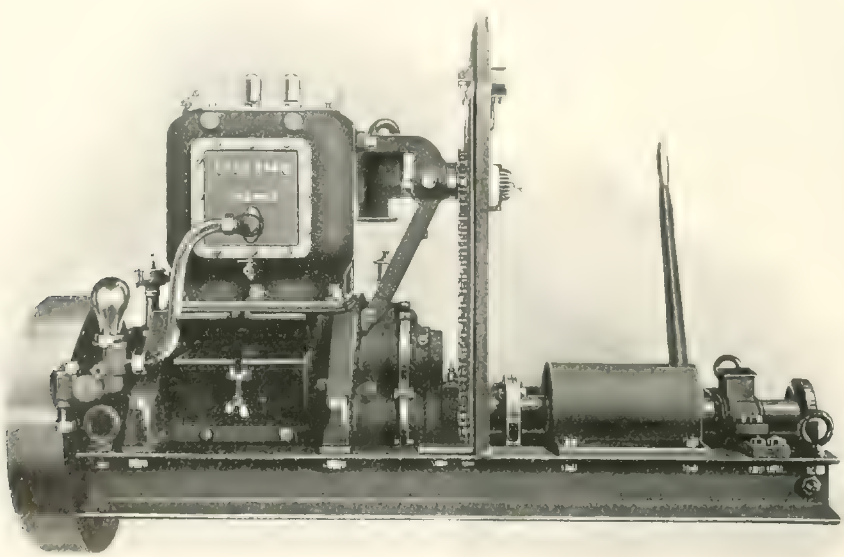
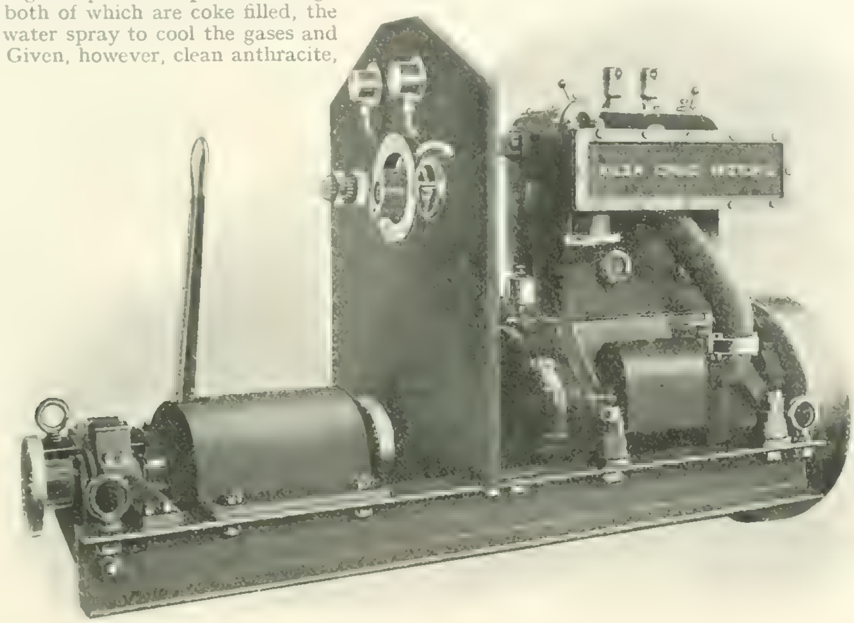


Fig. 2 —Port View of 16 h.p. twin-cylinder engine and control gear.

Figs. 2 and 3 show port and starboard views respectively of the 16 h.p. twin-cylinder engine and control gear, from which it will be seen that the arrangement and construction are of substantial and compact design, with ready access to various parts of the internal mechanism.

PRODUCER GAS FOR MARINE WORK.

THE application of producer gas plants for marine purposes has chiefly been confined to vessels of considerable size, but the *Pioneer*, built by the Dumbarton firm of MacLaren Bros. demonstrates the practicability of gas for even a 40 ft. cabin launch. The plant in question is of the suction type, the hopper being fed through a deck hatch. The gas, after leaving the producer, passes through a wet and a dry scrubber, both of which are coke filled, the former, however, having a water spray to cool the gases and deposit any tarry matter. Given, however, clean anthracite, the deposit is extremely small and cleaning of the scrubbers is only necessary at long intervals. The engine is a four-cylinder Crossley of 30 h.p., having a very high compression to ensure thorough combustion. Starting from cold petrol is used for the engine, a fan driven from which provides the necessary suction to start the generation of gas in the producer. The water supply for the producer is carried in the bilge tanks, which are of sufficient capacity for thirty-six hours' continuous running. The sea water for the scrubber is pumped up and discharged overboard after use. On a recent trial run a steady 9 knots was attained against a heavy wind, while on the return about 10 knots were touched. The cost for an hour's running is but 2½d. for fuel, against 2s. 6d. for petrol. For tender work such a boat, with its low cost of running, should be very suitable and the absence of smoke or smell renders the plant in every way suitable for passenger service.



Starboard View 16 h.p. twin-cylinder engine and control gear

Fig 3

Gas-driven Launch "Pioneer."

BOILER-ROOM EQUIPMENT.

III.

THE Weir Hydrokineter, a speciality of the pump-makers of that name, is a species of injector; a nozzle is fitted to the inside of the shell (supplied with steam either from one of the main or auxiliary boilers), from which the steam is projected through two or more conical converging nozzles fitted round the steam jet; through the wide ends of these latter, the cold water is drawn, and directed through the surrounding water in a stream of high velocity. Between the small bore steam outlet and the contracted end of the first water nozzle, the steam, which has been reduced in pressure and increased in velocity, is condensed, causing a flow of the surrounding water into this water nozzle, through which it is impelled, due to kinetic energy acquired, and passing through the outer water nozzle draws a further stream with it, the whole passing into the main body of water as a high speed jet. When the boiler is working at normal conditions the water temperature is more nearly the same as that of the steam jet, condensation does not take place so readily, and to fully effect this the outer cone assists, preventing the expansion of the steam that passes the first of the water nozzles.

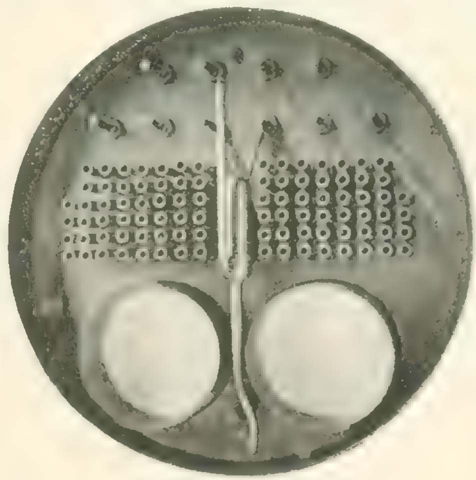


Fig 1

The Craig Heater acts in a somewhat similar manner, except that the steam nozzle is fitted outside the shell and incorporated in the check-valve chest. The steam jet is used while steam is being raised, and the feed water, itself injected through a nozzle, employed when the pumps are started. Both the steam and water jets, in their passage into the boiler, draw, by means of separate suction pipes, the dead water with them from the bottom of the boiler, and discharge it at the surface through the usual internal feed pipe.

The Bloomsburg Circulator, another of the same type, is fitted in the internal feed pipe at the warm part of the boiler. The feed water is forced through a tubular nozzle out into the surrounding water, drawing with it through a small-bore central nozzle, incorporated in the tube, the cold water from other portions of the boiler by means of suction pipes. A steam jet is also fitted for warming purposes, if required, when raising steam.

These three methods are all more or less dependent on a steam supply, either for jets or power, to drive the pumps, although this does not detract from their advantages where, as usually obtains, the donkey boiler is at hand and in service.

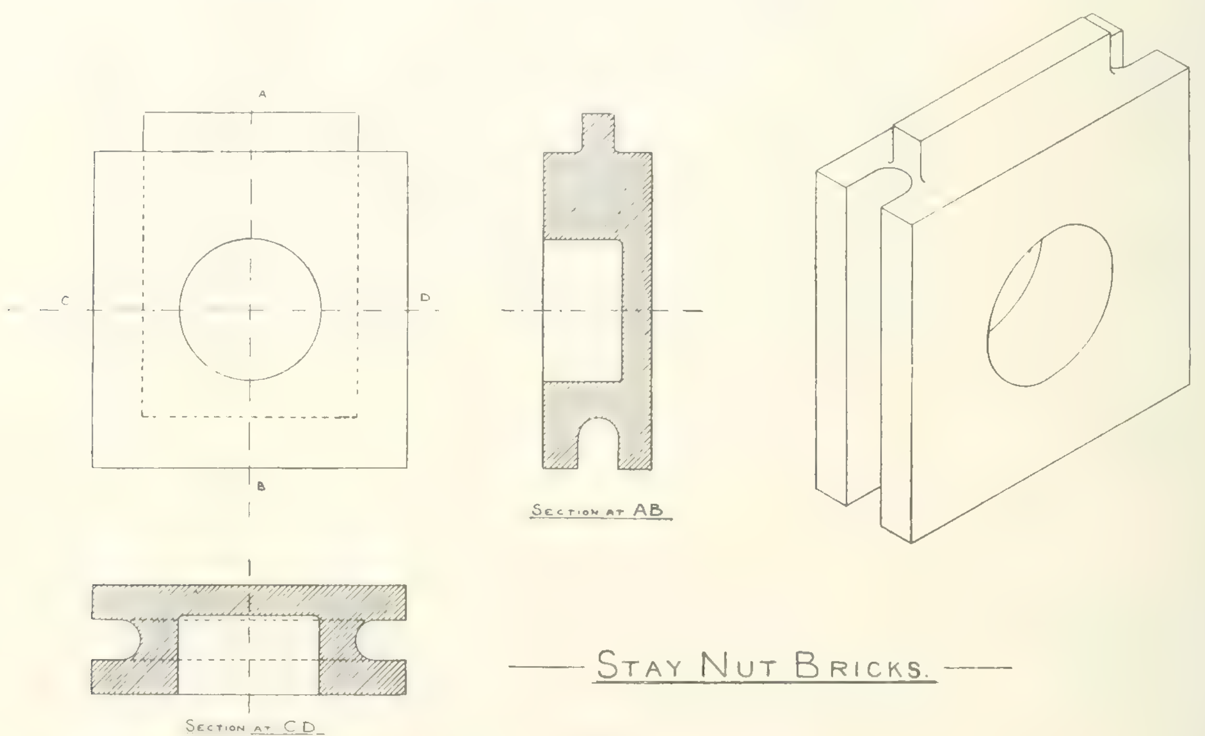


Fig. 2

Brundrit Temperature Balance. This circulator, Fig. 1, consists of a wrought-iron drum, having a suction pipe attached to its lower end reaching down to within a few inches of the boiler bottom, and a discharge pipe, with a goose neck, placed just above working level. The apparatus is suspended between the nests of tubes, by means of a clip ring round the top end of the drum to which hangers are attached and clipped to two of the lower line of longitudinal stays; the suction pipe is similarly clipped at its lower end, and the drum adjusted to midway between the top and bottom rows of tubes. When the apparatus is in this position, the water, when filling the boiler, flows up through the suction pipe into the drum, and partially fills the discharge pipe, sealing off and partly compressing the air in the drum above the discharge hole, which is a few inches up from the bottom end. As the water surrounding the drum becomes warm, the air inside tends to expand, and when the pressure thus raised becomes sufficiently high, the water in the discharge pipe is forced out at the goose neck, and cold water flows up the suction pipe to take its place, this action being repeated in a series of pulsating effects.

Another means for circulating which was tried a score of years ago and in part condemned, consisted in leading one or two internal pipes from the dead water to cocks on the front of the boiler; from the outside branch of these cocks, pipes were led inside the furnaces, above the fire, into and up the combustion chamber, where they were fitted to clack valves in the holes of removed fire tubes. The warming of the water in these water tubes induces a current to flow by convection upwards, delivering warmed water through the valve into the water space over the fire tubes, the valve preventing any formation of steam in the tube or admission of hot water. Although this was but a make-shift, and was considered somewhat dangerous, yet the principle is sound, and tube making and water tube methods have progressed since those days, nor is the circulation problem so perfectly solved that experiment is barred.

Stay Nut Bricks. The constant impinging of the flames and hot gases from the furnace direct on to the top and back plates of the combustion chamber, particularly where a system of forced draught is employed, eventually results in the burning of the projecting nuts of the stays, and if scale is present on the plates may result in collapse. The nuts thus exposed become so hardened on that, when renewal is deemed advisable, their removal is effected with some difficulty. The protecting brick illustrated in Fig. 2 has been devised to overcome this evil, and almost explains itself. The bricks are centrally cored, for part of the depth, to fit as a cap over the nuts, and are made of such dimensions as to suit the pitch of stays, so that the tongue of each succeeding brick fits into the groove of the next, thus affording a refractory protection for both nuts and plates.

The ordinary smoke-box door and its fittings, with the cleat and ring fastening, leave much to be desired, whether the boilers are operated under forced or natural draught. There are several defects in the door which result in losses due to badly fitting and partially closed doors, with their frequent buckling and consequent renewals and repairs. The means taken to lessen leakage, by caulking asbestos cord or putty into the open places of the joints to avoid repair, ultimately aggravate the evil, and the door requires to be faced or excessive buckling necessitates renewal.

Silley Smoke Box Door. The arrangement of the stiffening and fastening of this door is shown in Fig. 3. Small brackets are fitted on the smoke-box plating, which act as bearers for the wedges by which the door is closed. These wedges, which when driven home securely lock the door, are riveted to the short lengths of angle bar extending along

the sides and bottom of the door. The angles are kept in place by short tongue pieces, fitted on the door, which engage with slots, enlarged at one end and cut in one leaf of the angle, so that when the wedges are struck clear of the holding brackets, the angle is moved till the tongue piece on the door is opposite the enlarged end of the slot, when the angle with

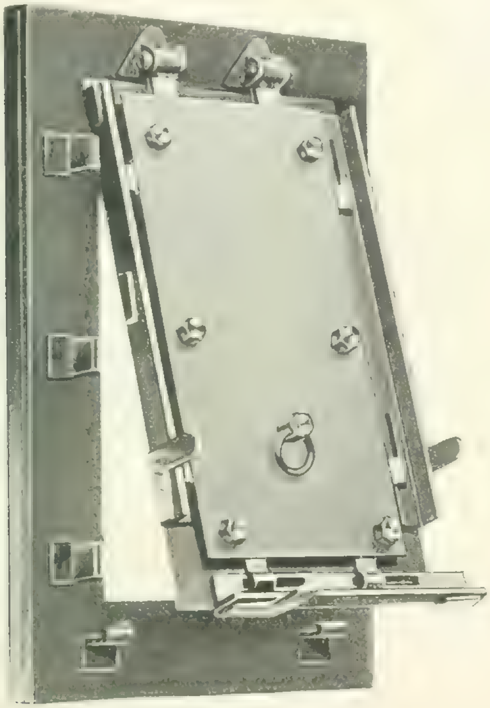


Fig. 3.

its wedges can be swung over on to the door, and the latter raised upon its hinges. When the door is shut, the angles are swung back again and the wedges hardened up, thus binding the door tight and forming, with the angle bars, a rigid girder round the sides, making an effectual air-tight joint and stiffening the plate to resist any tendency to buckle.

ELECTRICAL NOTES.

Ship Lighting.

An interesting paper has recently been read at Newcastle respecting ship lighting, which gives the main reasons for the present standards adopted at sea and the causes of the limitations. As we know the voltage is low, but what are the reasons for this? The author says primarily safety, even if more costly. The action of sea air is very marked on cables, leakage being liable to occur in plugs and switches on the upper decks and this increases directly with the voltage. He says also appliances such as those used in warships cannot be worked at a higher voltage than 110, and filaments of higher voltage do not last so long as those of a lower and require more frequent renewals. Again, there is the question of want of knowledge of those who are often set to work the plants, requiring every precaution being taken in the plant itself. Risk of fire is an important matter. A solution pointed to is the use on a British battleship of the three-wire system with 220 volts between the outers, and if successful the system is likely to be generally adopted at sea. The author recommends the electrical loads on the two sides of a vessel being divided with section boxes at several points, port and starboard, connected by a short heavy cable, these giving a duplicate wiring. Lighting is not now such an important item of the equipment of modern ships, power taking a larger share. This is seen particularly in the case of the *Lusitania*; still, lighting is costly owing to the expensive way the leads have to be put in not to affect adversely the artistic appearance of the panelling, etc.

Electrical Speed Variation.

The constant changes required in speed by machine tools, suggests the electrical method. It has not yet become by any means general; makers cling to old-time ways naturally. Taking a lathe for general work, as an example, the change required is about 1 to 70 with 16 speeds. Now, if a saving in time is to be made in cutting, we must look to the variable speed shunt motor to do it, in which we can have as many contacts on the regulating switch as we wish, and we can thus vary the speed without stopping the work and so obtain a much higher efficiency. We must not make too much of a change at a time as is done in the mechanical method, whereas in the electrical plan the ratio of change in cutting speed is less and the more nearly does the average cutting speed approach the maximum economical speed and make for efficiency.

Electric Magnetic Clutch.

Such a clutch as we are about to describe is said to be practicable when mechanical types would not be. They can be controlled from a distance, are more definite in holding power and cannot possibly seize. Such advantages are claimed for that introduced by Messrs. Lugard & Co., Field Buildings, Middlesbrough. An electro magnetic body running loose on the shaft has an energising coil wound for any voltage embedded in it. The armature consists of a disc fixed to the shaft and this carries a ring of non-magnetic material, arranged so that when continuous current is supplied to the energizing coil through the slip rings, the two parts of the clutch are held in position by magnetic attraction. The two faces of the clutch do not come in actual contact, but are kept apart by the thrust ring, which leaves an air gap between them so that they cannot be damaged by slipping off the clutch. For marine propulsion this Vulcan clutch can be arranged between the engine and propellor shafts so that the engine runs at a constant speed, the clutch slipping to vary the speed of the vessel. Such clutches have been installed to transmit 600 H.P. at 350 revolutions per minute, and among vessels equipped in this way are patrol boats on Russian rivers and a steamer on the Lake of Geneva.

Dock Electrical Engineering.

Probably the North-East Coast is ahead of other centres in this department of engineering, the improvements effected having been so many and so various of recent years. The Mercantile Dry Dock of Jarrow is an instance of this fact, in which the excavating of a new dock recently was carried out by the use of an electric cable transporter. By these means the material was lifted 50 to 80 feet vertically, conveyed beyond the end of the dock and dumped into wagons by the cable way. The same gear handled also the many thousand tons of stone, concrete, timber and other materials used in the dock construction. For the purpose required the headmast was erected partially on the piling of the coffer dam and the supports or towers travelled on rails on a trackway laid square to the central line of the dock, thus allowing the cable way to be moved across and cover the whole area of the dock, the total span being 560 feet. The main cable was laid between the head and tail masts and worked by an electric winding engine on the side of the dock, the carriage having beneath it the load wheel over which passed the lifting rope. The cableway was capable of dealing with loads of five tons, lifting at 220 feet per minute and traversing at 900 feet, the whole arrangement complete being supplied by Messrs. John Henderson & Co., of Aberdeen.

P. and O. Fares to Egypt.—The P. and O. Company announce the following rates for passages by their steamers to and from Egypt between May 15th and Sept. 15 inclusive.

		First Saloon.	Second Saloon.
Port Said-London (in either direction)		[illegible]	[illegible]
Port Said-Marseilles	do.	[illegible]	7
Port Said-Brindisi	do.	7	

These rates are free of surtax, but will carry no abatement in respect of the return journey.

Industrial and Trade Notes.

THE CLYDE AND SCOTLAND.

(*From our Own Correspondent.*)

Shipyard Agreement.—An event of outstanding importance so far as the shipbuilding industry of the Clyde and other British districts is concerned was the meeting of shipbuilding employers and workmen in Edinburgh on March 9th, at which the negotiations in connection with the agreement for the prevention of disputes in the shipbuilding industry of the United Kingdom were concluded, and this agreement, formally accepted by both employers and men. It is by far the most important contract that has been drawn up in the shipbuilding industry and its effects will be far-reaching. By it the shipbuilding employers throughout the United Kingdom and the members of twenty-six trades unions interested in the shipbuilding industry bind themselves to submit all matters in dispute to local and national conferences before there is any stoppage of work. Thus far the scheme is on the lines of that now existing between the engineering employers and the engineering trade unions, but in the case of the shipyard agreement there is a provision that a final court of appeal may be constituted by calling a conference of representatives of all the employers and of all the trade unions who are parties to the agreement. This means that no stoppage of work can take place until all the trades interested have discussed the point in dispute. The new agreement will continue in force for three years, and will, therefore, be subject to six months' notice in writing on either side, said notice to be competent until the three years have expired. There will no doubt be some difficulty at first in getting the varied interests represented by twenty-six trade unions to fall into line on every occasion, but these difficulties will become fewer as both parties gain experience of the agreement, and it will almost certainly be found that the different trades have so much in common that their interests will clash only at very rare intervals. Generally speaking, it will be of immense benefit to employer and employed, not only directly, but indirectly. Employers will be able to compete for orders with more confidence without the haunting and hampering fear of industrial strife, and as their prospects of success will be greater there will be more employment for the workmen.

Naval Matters.—In Clyde shipbuilding and shipping circles, as elsewhere, the Navy Estimates, since being issued, have provided a fertile text for criticism, and this perhaps naturally has mainly taken the form of complaint as to the inadequacy of the programme. This consists, briefly, of four "Dreadnoughts," six protected cruisers and twenty destroyers, as well as a number of submarine boats. In addition power is sought by the Admiralty should it be found necessary, to make preparation for the rapid construction of four more large armoured ships, beginning on April 1st next year and completing the vessels by March 31st, 1912. Perhaps the most gratifying feature to Clyde and other naval constructing firms is the intimation that the two "Dreadnoughts" which are ear-marked for the private builder are to be given out to contract almost at once. The usual period for the issue of contracts is November, but as 1st July is the date on which the construction of these two battleships is to be commenced, it follows that the specifications will require to be issued almost immediately. It is, of course, a matter of fond speculation as to what chances Clyde establishments have of securing a share of these important contracts. The competition between the Clyde, Elswick, Jarrow, and Barrow-in-Furness will doubtless be of a very keen character. It is more certain that a goodly share of the protected cruisers will go Clydewise, and in their case, also, it is understood that construction will be hastened forward. These vessels will embody, with further developments, the ideas which characterize the Clyde-built *Indomitable* and *Inflexible*.

New Shipbuilding Contracts.—The improved condition of affairs, as regards the placing of fresh contracts for tonnage, which it was possible to point to in last month's notes has been on the whole well maintained during March, and with the resumption of the longer working hours there is happily a larger volume of tonnage on the books, if not on the stocks, of Clyde shipbuilders. The following are the principal contracts booked since last month's notes were penned :—Messrs. William Hamilton & Co., Port Glasgow, another large steamer for Messrs. J. Haidie & Co., Glasgow ; Messrs. Arch. MacMillan & Son, Dumbarton, two ; and the Greenock and Grangemouth Co., Greenock, one for the same owners ; Messrs. Yarrow & Co., Scotstoon, a triple-screw turbine yacht for an American owner ; Messrs. Lobnitz & Co., Renfrew, five barges for an Eastern port ; Messrs. William Simons & Co., Renfrew, a powerful suction dredger for the British Government to be employed in the improvement of the Port of Lagos, West Africa ; Messrs. Ferguson Brothers, Port Glasgow, two powerful dredgers for the London and North-Western Railway Co., and a dredging barge for colonial owners ; Messrs. Fleming & Ferguson, Paisley, three hopper steamers for the Argentine Government ; Messrs. Mackie and Thomson, two steam drifters for Aberdeen owners ; Messrs. Russell & Co., Port Glasgow, two large steamers for Glasgow owners ; Scott's Shipbuilding and Engineering Co., Greenock, a steamer of 7700 tons for the Clyde Shipbuilding Co., for trading in Eastern waters.

Destroyers for Australia.—Messrs. William Denny and Brothers, Dumbarton, and the Fairfield Shipbuilding and Engineering Co., Govan, have had a joint tender from them accepted by the Commonwealth Government of Australia for the construction of two torpedo boat destroyers at a cost of £82,000 each, including armament. One of the vessels is to be completed in fourteen and the other in fifteen months, and the materials for a third destroyer are to be prepared in a year, the price to be paid being £71,000. This vessel will be put together in Australia. The construction work in Scotland will be supervised by Professor Biles, of Glasgow University, and a number of Australian workmen will be sent to the Clyde to take part in it, the number probably not exceeding 24 to 12 in each yard. The first intention of the Australian Government was to build a fleet, and they asked tenders from the leading shipbuilders for the construction of twelve vessels, some of them to be built in this country, and some in Australia. The boat in the present order, which is to be built in sections, will be constructed on the Clyde. She will then be taken down and shipped to Australia, whose workmen will thus gain valuable experience in the construction of such craft.

Modern Gun-making at Parkhead.—West of Scotland engineering circles are naturally interested in the progress being made by Messrs. William Beardmore & Co., Parkhead, with the manufacture of one of the up-to-date weapons ordered by the Admiralty. The new 12-in. wire guns, mark X.I., which are an improvement on the big guns of the *Dreadnought.* Apart from the old-time celebrated "Canonades" of the Carron Co., the weapon in question is the first naval gun ever made in Scotland. It is at any rate the very first modern naval gun and has been in hand for several months. It has advanced steadily through the multifariously intricate processes of construction until now it has been brought into recognisable shape. Some time must yet elapse before the monster weapon, measuring 60 ft. in length, will be ready to leave Parkhead works to undergo the tests imposed by the Admiralty. Thereafter, should all go well, it will be placed on board one of the new Dreadnought battleships.

Airship Trials at Dumbarton.—Encouraged by the firm he serves—Messrs. William Denny & Bros., Dumbarton—Mr. Edwin Mumford, who for many years has been head experimenter in the experimental tank in Leven shipyard, has been studying and experimenting with airships and a machine embodying his ideas was to have been tried on March 15th, but a slight mishap taking place to one of the propellers, the trials had to be postponed. The airship, it is reported, is of novel design, being fitted with six propellers in nearly vertical axis and capable of lifting the structure vertically and then attaining a high horizontal speed. The propelling engine is of 24 h.p., the motive power being air-cooled petrol.

Orders for Electric Tools and Cranes.—The Consolidated Pneumatic Tool Co., Ltd., London and Fraserburgh, have received an extensive contract for tools from the Government. The order is to supply 300 electric drills, at an average cost of £50 each, the total contract thus amounting to £15,000. This is the largest Government order ever placed in Fraserburgh. The tool works

meantime employ 150 hands, but provision is being made for additional mechanics. The firm of Messrs. Babcock and Wilcox, Ltd., Renfrew, whose works there are now enlarged to overtake contracts of the kind, have received orders for three electric overhead travelling cranes for the extension of His Majesty's dockyard at Devonport.

THE TYNE.

(From our Own Correspondent.)

Shipbuilding Prospects.—The rumour has lately been current, that an eminent shipbuilding firm of Belfast had opened negotiations for the acquisition of a controlling interest in a leading Tyneside Yard, but the validity of the statement has not been vouched for by the firm in question, and it may, consequently, be dismissed as a thing unlikely to come to pass. Such unauthenticated statements do much harm, as they raise hopes which can only result in disappointment, and the people concerned are already sufficiently afflicted by lack of work. The situation is, indeed serious, although one small incident of a cheering character has to be reported, namely, the withdrawal from the ranks of unemployed steamers of some half-dozen vessels, which have not been replaced by others. The incident may, therefore, be looked upon as a gain, and slight as it is, is calculated to arrest somewhat the tendency to regard things in the worst light. Two schemes, with regard to which we have written disapprovingly in past numbers, are now admittedly failures and we only refer to them at present with the view of emphasising the necessity of caution in considering new-fangled projects for stimulating business, or economizing production. We refer to the proposals for amalgamating engine works, and for establishing an international Union of shipowners, for the limitation of freight-carrying accommodation. The first scheme could not succeed, on account of the impossibility of reconciling interests, and the second was just as much off the road to success, for, practically, the same reason. Chimerical projects like these can never bring any good to their promoters, or anyone else, and so far as shipbuilding is concerned, there are in our opinion only two courses open—either to take matters easily and wait patiently for the coming of better times, or to devise measures for the reduction of productive costs to the lowest possible limits, with the view of making quotations for new tonnage low enough to attract orders from every available source. The bolder course is, we think, the wiser course, and if it is not taken now, it will most assuredly have to be taken later on, when the impediments to recovery will have become infinitely greater.

The Shipyards.—Since last month, the depression in this district has deepened perceptibly, and at a number of Tyne yards, operations have been entirely discontinued, whilst in other cases, work is only being carried on by the foremen and apprentices. There is really, at the moment, not one shipbuilding establishment on the river that can properly be called busy, whilst the aggregate total of idle berths is so large as to be unprecedented. The only redeeming feature in the situation is that there is a fair amount of repairing work in hand. Among the most important contracts may be mentioned the overhauling of the cable steamer *Faraday*, by Messrs. Hawthorn, Leslie & Co., and the repairing of the large tank steamer *Hesperus* by the Palmer's Company. The first-named vessel was built at Walker nearly forty years ago, and was, when launched, one of the very largest vessels then afloat. It is understood that Messrs. Hawthorn, Leslie & Co. have also secured the contract to carry out extensive repairs to the Russian steamer *Mercury*, which is to be placed in their graving dock shortly. Messrs. the Smith's Dock Company have received the contract to carry out necessary internal repairs to the Bilbao steamer *Albauto*, and have also been commissioned to repair the Danish steamer *Norden*, a new vessel which received damage whilst leaving Sunderland on her first voyage. The cargo had to be discharged at the Albert Edward Dock, North Shields, to admit of the repairs being effected. The large battleship *Invincible*, which has been completed by the builders, Messrs. Armstrong, Whitworth and Co., has just left the Tyne for Portsmouth where, it is expected, she will shortly be placed in commission. It is stated that some thousand operatives, who were kept working on the vessel to the last moment, will now be thrown out of employment.

The Commercial Dry Dock Company have two or three vessels under repair, and at the Wallsend Slipway Works and the Tyne Pontoon Co.'s works, there are also several repair contracts in hand. The ship and engine repairing firms at Tyne Dock are all fairly well off for work, and Messrs. Brigham & Cowan, at the entrance to the river, have a large vessel being repaired in their graving dock.

The announcement has just been made that Messrs. Armstrong, Whitworth & Co. have acquired, at Walker, a piece of ground 25 acres in extent with a river frontage of over 2,000 feet, which was formerly the site of the Walker ironworks. Buildings will be erected and necessary accessories provided for the formation of an up-to-date fitting and repairing yard. It is quite possible also that one or two berths for battleships may be prepared. This enterprise of the Armstrong Company is a most auspicious event for Walker, and for Tyneside generally, as there is no doubt that, in the near future, business will be immensely stimulated.

Engineering Work.—When shipbuilding is slack, it cannot be expected that marine engineering will be in a condition of prosperity, and that it is not so at the present time must be apparent to the most casual observer. The Wallsend Slipway Co.'s works is about the only establishment showing any approach to the normal state of activity, and even there, only a portion of the productive resources are being brought into requisition. Manufacturers of steamship auxiliary machinery are, as might be expected, still finding it almost impossible to secure orders, only firms that have specialities of proved efficiency being in a position to maintain a fair show of work. Among such firms, Messrs. Watson, of the High Bridge Works, Newcastle, may be particularized, their patent feed-water filter, their ballast pumps and other specialities, having achieved a very wide popularity. Electrical works are being kept fairly busy, particularly those establishments that are devoted to the manufacture of colliery plant. Messrs. J. H. Holmes & Co., however, of the Portland Road Works, have some good shipbuilding contracts in hand. Steel works at Jarrow and other places are kept moderately busy, but the forging industry is at the very zero of depression, and the worst of it is that, in this case, a revival is not to be looked for contemporaneously with any revival that may take place in shipbuilding, as foreign forges hold the field in so far as regards lowness of price. It seems to us that if labour was equally cheap in this country as in Germany, there is no valid reason why English forges should not be able to compete successfully with similar establishments in other countries. Coal shipments at Tyne Dock continue to be very satisfactory, the high figure of 34,831 tons having been reached on a recent date. This nearly equals the record shipment at this centre, which is attributed to a date in 1893.

THE WEAR.

(From our Own Correspondent.)

Shipbuilding.—At the annual meeting of Messrs. Doxford's, which was held on the 16th inst., the chairman stated that the output of tonnage from the yard last year was the smallest since 1893, aggregating only five steamers of 20,271 tons capacity, as compared with twenty-two steamers of 91,254 tons' capacity launched in the preceding year. This is an immense falling off, and nothing can show the severity of the depression that has come upon shipbuilding more vividly than this. The chairman, speaking in a hopeful strain of the future, said that they had put down a steamer of a new type, which, if successful in the way of fulfilling anticipations, would have many duplicates by-and-bye. The firm have three other vessels on the stocks, and are pretty certain to improve this year upon the output of last year.

Messrs. Short Brothers have four vessels in hand and are employing nearly the average number of men, and at Messrs. Robert Thompson & Sons' Yard, business is still pretty brisk. Messrs. Osborne & Graham are going to have a busy time, having four vessels in early stages of building, and Messrs. Crown & Sons have also enough work to make their yard

busy in the near future. When this is said, however, all is said so far as future possibilities of a busy time are concerned, as all the remaining yards are short of orders for new work. There is some repair work in the port, Messrs. Austin being particularly busy in this line. The ss. *Clydesdale* is on the pontoon receiving a big repair, and another vessel, also being extensively repaired, is in the graving dock.

Engineering.—A pretty fair standard of briskness is still being maintained at the North-Eastern Marine Engineering Co.'s Works, but at the other marine engine works, slackness is still the feature. In most cases, short time is being worked, and there is not much prospect of any early change for the better. Local ironworks are only intermittently employed, and work at the forges is reduced to practically nothing. Foundries have little to do and local brass and copper works are almost at a standstill. There is not much doing at the docks, but a good inflow of timber cargoes is expected shortly.

BELFAST.

(*From our Own Correspondent.*)

Messrs. Harland & Wolff.—Before these notes are in print this firm will have launched a steamer named *Mallina*, for Brisbane. At the fitting-out berths they have the Canadian White Star liners *Laurentic* and *Megantic*, the Atlantic Transport Company's *Minnewaska*, the Red Star liner *Lapland* and the *Karoola*, for Messrs. McIlwraith, McEacharn and Co., Ltd., London. The last-named vessel was launched on the 9th of March, and her dimensions are: Length, 436 ft.; beam, 56 ft. 4 in.; and gross tonnage about 7,500. She will have accommodation for a large number of first, second and third-class passengers. She will also have extensive capacity for general cargo, horses and cattle, in addition to frozen meat space. The machinery consists of two sets of quadruple-expansion engines of the balanced type. This fine vessel is intended for trading round Australia. At the time the fitting out of the magnificent new Red Star liner above referred to was completed her owners were, unfortunately, not in immediate want of her, consequently she was laid up for two or three months in the Musgrave Channel. The finishing touches are now being put to her, and before these notes are published she will have proceeded on her trial. The wagging tongue of rumour has for some time past been busy with the name of Messrs. Harland & Wolff. More than one yard on the east coast has been mentioned as about to be acquired by the Queen's Island firm, with a view to embarking upon the building of battleships, that belonging to Sir James Laing & Sons, of Sunderland, being the latest spoken of. None of the reports have, however, been backed up by official confirmation. Certainly, if it is the firm's intention to go in seriously for Admiralty work, this can scarcely be carried out in the existing establishment on the Queen's Island, all the available building berths being required for the construction of ocean liners of the biggest dimensions for which Messrs. Harland & Wolff's name has long been world-famous. And what about Messrs. John Brown & Co., of Clydebank, with whom the Belfast firm has at least a "community of interests," and who can, and have, turned out government work of the highest class?

Messrs. Workman, Clark & Co.—This firm is, at time of writing, preparing for the launch of one of the two big liners which they have on order for the Orient Line. Since the publication of last month's issue they have launched another steamer for the Tropical Fruit Steamship Co., Ltd., Glasgow (Messrs. Clark & Service, managers). The new vessel, which is named *Turrialba*, has a gross tonnage of about 5,000, and has been specially designed and constructed for the West Indian banana trade. The propelling machinery is a set of triple-expansion engines intended to drive the vessel at a speed of 15 knots. The fruit steamer *Abangarez*, built by this firm for the same owners, is about ready for sea.

The Harbour. The Harbour Commissioners have definitely decided to make an early start upon the deepening of the Victoria Channel, which matter was referred to in last month's [illegible].

NORTH-WEST OF ENGLAND.

(*From our Own Correspondent.*)

State of Trade.—Trade is bad yet in Barrow, and many idle hands are walking the streets. The shipyard is not employing any more hands and any man who is supposed to be connected with the projected Spanish work is worried to death by men after work. The launching of the *Vanguard* may mean the starting of more men, but not a great deal, for wood-workers are getting less to do than ever on present-day battleships. The other work in the yard is not of any great magnitude, and an order or two would be greatly welcomed, and if the order meant the building of a western ocean flyer then there would be some chance for men. It is this class of ship that does find work for many and a great variety of hands, but the battleship, though it means millions, limits the employment. It would be a welcome sight to see one or two passenger ships of size building at Barrow. All would welcome them, but the difficulty seems to lie in the fact that orders for these seem to run into certain channels, none of which lead to Barrow. An opportunity will probably come some day and it is to be hoped that Vickers will make the most of it. The workers will. In a few months the stocks at Barrow will be getting to look empty. The Brazilian "Dreadnought" and the Canadian Icebreaker will not be long, and then there will only be left the second-class cruiser and the submarines in this shed. The naval programme raises one's hopes and after what Mr. M'Kenna said about Vickers' at the launch of the *Vanguard* it is to be hoped he will express his appreciation of the existence of Vickers' by encouraging them with an order. There is nothing like practical appreciation. An order for a battleship or cruiser is worth a book full of "nice words." Northerners call it soft soap.

The Spanish Work.—Preparations for starting on the Spanish work are proceeding apace, but now that facts are getting out it is more than probable that only about 15 per cent. of the work will be done in this country. This is a great disappointment, for many in this country, but the fact remains that Vickers' and Armstrong's have nearly all the work to do at Ferrol in Spain, while the gunboats will be built at Cartagena. It looks as if little more than armour is to be made in this country. The programme may be slightly altered, but not to any great extent. There will be a certain number of men who will go out to the yards, but even this number will not be very great. There are to be three battleships, something after the *Lord Nelson* type, but they will carry eight 12-in. guns. Their tonnage will be a few hundreds below 15,000. These have to be built in six years. There are a number of gunboats and destroyers.

The Argentine Tenders.—It is some time since I referred to the likelihood of the Argentine requiring battleships, and the tenders are about in now for two vessels as big, if not a little bigger, than the Brazilians. It looks from this that the Brazilians are going to Brazil. The competition for the Argentine work is keen, to say the least of it. Vickers' are in with Armstrong's, and have had their heads very closely together for some time over the tenders and the designs. In fact, I am told that Vickers' and the Elswick firm were never so closely combined for foreign work as they are at present. Cammell Laird's, Brown's, etc., have all thrown their chances into one hat. Then there are strong continental combinations. Vickers-Armstrongs are the favourites. They are so capable at the designs as shown in the Brazilian and Spanish contracts. Again, from a financial standpoint they are very strong—the strongest in the world—and that is greatly in their favour when dealing with a country like the Argentine.

The "Vanguard."—Since coming to the new wharf work has been proceeding apace on the *Vanguard*. The boilers are being put in without delay, and already several of the uptakes have been put into position. The big crane is doing its work satisfactorily, but there seems to be the want of another smaller crane to handle the smaller stuff off the waggons, and I understand a seven-ton crane is being built for the purpose. There is also the likelihood of some sidings being put down, as one through line is hardly capable of coping with the rush of stuff. On the wharf, stores and sheds have been built in record time, and it will not be long now

before everything is complete. Hitches have been rumoured. All these rumours have been baseless. Work is proceeding splendidly.

The "Sao Paulo."—It has been decided that the Brazilian battleship shall be launched during the week commencing April 19th. The actual date has not yet been fixed by the Brazilian Commission. This vessel is spoken most highly of by many who are in the position of comparing vessels, and there are some who do not hesitate to say that she is superior to the *Vanguard*. She will carry two more 12-in. guns and there are many different arrangements. She seems roomier and appears to be better arranged, at least so say some critics. There can be no doubt about it, this vessel is a splendid job and highly creditable to the designers and the builders. Her engines are ready now, and as soon as she comes alongside the new wharf the boilers will be shipped. There is not the same great hurry about her as the *Vanguard*. It will be a remarkable sight to see two huge "Dreadnoughts" completing at one wharf, representing a total tonnage of close upon 39,000 tons and over 40,000 i.h.p. These figures will help up Vickers' total this year considerably.

25-knot Forts.—Some years ago Mr. James McKechnie, the manager of the engineering side of Vickers', read a remarkable article on gas-driven warships, and there followed some very remarkable articles in the half-penny press. The paper was not so much based upon actual experiment, but was in the shape of an imaginary peep into the future. Some time after Messrs. Beardmore, at Dalmuir, put a set into the *Rattler*, and their experiments were successful. They did not aim for great power or speed. Now comes the story, which appears in a London evening paper, that the Government are about to build a great battleship of 21,000 tons, which is to travel at the rate of 25 knots, is to carry any amount of 13·5-in. guns, and is to be driven with internal combustion engines "which Vickers' experimented with some time ago." We are told that the Admiralty have been experimenting with this class of engine and the results merit this great step. It is a remarkable statement. As the American would say, "It's the limit."

In view of the tremendous developments in turbine machinery, in view of the remarkable performances of the new cruisers, and in view of the time it took the turbine to work its way through small craft to destroyers, then to cruisers and after much worrying to battleships, it sounds a very "high" story. To tell the truth, I do not think that present engineers in our great works in this country are devoting a moment's thought to the internal combustion engine, unless it be for submarines. For a floating fort of 21,000 tons to obtain a speed of 25 knots, something like 30,000 to 40,000 i.h.p. would be required. Would that be possible with this engine? It is not worth arguing further. The article has provided much amusement, though.

Naval Estimates.—There is a £500,000 item in the Estimates for submarines. This means work for Barrow, of course, although some of the vessels will be built at Chatham. In respect to the battleships and cruisers, orders for which will be given out this year, Barrow is almost sure of one of these. It would hardly do to hope for one of each, although Vickers' could easily deal with the work, but there are other yards which will want a share.

H.M.S. "Liverpool."—This second-class cruiser is well in hand now, the keel having been laid on the 7th January. This is the first keel to be laid of the five cruisers of this class which were ordered in November last. This vessel has to be completed in twenty-one months, and it is said will have a speed of over 25 knots. The designs have undergone some alterations since the orders were given out.

Hæmatites.—The iron and steel trade is very quiet indeed, and prices in iron have suffered a further fall. Makers are now asking less than 57s. per ton net f.o.b. for mixed Bessemer numbers, while warrants are close upon 55s. Warrant stores are on the rise. The Japanese Admiralty have been customers for hæmatite iron, which has been shipped to one of their naval ports. Some 5000 tons has gone and there is more likely to be ordered.

Shipping.—Shipping on the whole is dull, with freights low. There is a momentary improvement in the shipments of iron and steel, and this year's total is twenty thousand tons ahead of the aggregate for the corresponding period of last year.

MERSEY AND MANCHESTER SHIP CANAL.

(From our Own Correspondent.)

Repair Work.—Overhauling and repair work has been pretty brisk during the past month, Messrs. H. & C. Grayson, Ltd., Cammell, Laird & Co., Ltd., and Clover, Clayton and Co. having had their hands full of many and varied jobs. Messrs. David Rollo & Sons also have several important contracts in hand, including new main boilers for the s.s. *Liverpool*, and extensive collision damage on the Waterford Steamship Co.'s s.s. *Reginald*. Messrs. Rollo have now completed the work to the s.s. *Clodach*, belonging to the same company, and the vessel has again resumed her sailings. They are also busy fitting an electric lighting installation to the s.s. *Lugano*. Messrs. Clover, Clayton & Co. have a good deal of work in hand, including extensive overhaul and repair to the Ellerman liner *Oporto*.

H. & W. Nelson, Ltd.—Great satisfaction is expressed locally that Messrs. Cammell, Laird & Co., Ltd., have secured the order for a new large passenger vessel for these people's River Plate service, as it is understood they secured the order against very keen competition. Six vessels are to be ordered, but up to the present only three have been placed—one with Messrs. Cammell, Laird & Co., Ltd., and two with Messrs. Russell & Co., of Port Glasgow, which latter were placed a few weeks ago, and the work is now well in hand. Engines for these two boats will be supplied by Messrs. Rankin & Blackmore, of Greenock. It is rumoured that Messrs. Cammell, Laird & Co. have also secured the order for a fourth vessel, but this is not yet confirmed. I learn, also, from a reliable source that another vessel is just about to be placed, and will most probably go to the North-east Coast. A few particulars of the new vessels—which are all duplicates—are as follows:—Length, 405 ft.; draught (fully loaded), 25 ft. 6 in.; beam, 52 ft.; carrying capacity, 8425 tons; speed, 14 knots; refrigerating holds for 150,000 carcases; engines, about 5600 i.h.p. Special attention is to be given to the passenger accommodation, which will be superior to that of all other vessels trading to South America.

Wallasey Ferries.—The Wallasey Urban District Council have entered the market for two new ferry steamers, for which Messrs. Cammell, Laird & Co. are tendering, together with several firms in the Clyde and Tyne districts. They are to be a distinct advance in the way of ferry steamers, and will have comfortable sheltered look-out boxes for captain and mate, situated on a navigating bridge above the promenade deck.

The Emprezia Nacionale are in the market for a new steamer, but up to the time of writing no definite information is available.

The new steamer for Messrs. David McIvor & Co. has been placed with Messrs. Blair & Co., of Stockton-on-Tees.

Alexandra Towing Co., Ltd.—These people have placed an order with Messrs. J. T. Eltringham & Co., of South Shields, for a new tug boat.

Eastham Ferries.—It is understood that the Eastham Ferry and Hotel Co. are asking tenders for a new steamer for ferry service on the Mersey.

Isle of Man Steam Packet Co., Ltd.—At a meeting of directors of the Isle of Man Steam Packet Co. held on March 4th, the chairman announced that they would shortly be asking tenders for a new vessel, somewhat larger than their s.s. *Tynwald*.

Elder, Dempster & Co., Ltd.—Regarding the two new steamers for these people, I learn that Messrs. Richardsons, Westgarth & Co., Ltd., have secured the order for the engines, to be built at their Hartlepool works.

Alfred Holt & Co.—These people have asked tenders for two new steamers, but up to time of writing only one has been placed—with Messrs. Hawthorn, Leslie & Co., of Newcastle.

Cammell, Laird & Co., Ltd.—Special attention should be drawn to the exceedingly quick work executed by this firm in the despatch of the new tug boats for the Buenos Ayres and Pacific Railway Co. On March 1st three of them left the Mersey, a fortnight later four more were despatched, leaving only two for delivery, each of which was engined and fitted up complete within seven days from launching.

These vessels were built under the superintendence and to the specification of the well-known Liverpool engineer, Mr. W. B. Cumming, and quick despatch such as this speaks well for the facilities which Messrs. Cammell, Laird & Co., Ltd., have at their command. Regarding the vacancy as chairman of the company, occasioned by the death of Dr. Francis Elgar, this matter is still unsettled, although I understand that Mr. D. B. Morison, managing director of Messrs. Richardsons, Westgarth & Co., Ltd., has been approached *re* same. Mr. Morison has also been elected to take Dr. Elgar's place on the Board of Trade Advisory Committee.

Birkenhead Dock Disaster.—As is now well known through the daily press, an unfortunate accident occurred at a Birkenhead dock, through the bursting of a dam, resulting in the loss of fourteen lives. Messrs. Scott & Co. have for some time past been constructing a new dock called the Vittoria Dock, which is now nearing completion, and the dam which burst had been built across the entrance of the dock from the East Float Dock, to enable the workmen to get at the bottom of the dock gates, but owing—it is surmised—to the excessive pressure of the water in the dock, the dam suddenly collapsed at the top, the terrible rush of water carrying with it a tremendous amount of mud from the dam, which entirely covered the unfortunate men below. Only three out of seventeen men were saved, and up to time of writing none of the bodies have been recovered, despite the incessant efforts of the divers.

S.S. "Bengar."—It has unfortunately been found necessary to abandon the attempt to salve this vessel, which is now a total wreck at Garston. Owing to the ship having a list of more than 35 degrees, the bottom has been so severely damaged as to make temporary repair impracticable. However, Captain Young, of the Liverpool Salvage Association, has been able to save nearly all the copper on board.

An interesting test was made on board the Liverpool Salvage Association's steamer *Linnet* on the 1st inst. with a submergible electric motor for pumping purposes, in the presence of a very representative gathering. The pump is the invention of Mr. W. R. MacDonald, of London, and during the test was run under water without a casing, with just the same efficiency as when dry.

New Dock Board Salvage Steamer.—Much interest is being centred in the new steamer *Salvor*, belonging to the Mersey Docks and Harbour Board, which arrived here on the 1st inst. from Messrs. J. P. Rennoldson & Son, of South Shields, which is another mark to the credit of the enterprising Dock Board. The *Salvor* is one of the best-equipped and most up-to-date "wrecking" vessels in the world, being 110 ft. long by 25 ft. beam by 10 ft. 6 in. depth, classes 100 A1 at Lloyd's, and is built throughout 25 per cent. in excess of their rules. She is exceptionally well fitted out with the most efficient pumping plant and other raising apparatus.

Manchester District.—Trade in Manchester has unfortunately been very bad, and but for a few paltry repairing and overhauling contracts, the marine engineering firms in the port would have been more or less idle.

THAMES.

(From our Own Correspondent.)

Port of London Authority.—This newly appointed body has had its first sitting, as arranged for the 16th ultimo, and the occasion, a notable one, was taken by the chairman, Sir H. Kearley, to make a speech outlining the future that is before the port and asking for the goodwill and assistance of all those concerned in the task that is before them. The several undertakings were not due to come into possession of the authority till the 31st ult., so that the meeting on the 16th was by way of a preliminary only and was held in the Board Room of the London and India Dock House. Among the names of those on the Authority, we notice Lord Ritchie, Sir C. Furness and Sir E. Cornwall, Messrs. Philipps, Brightman, Shadforth Watts, Broodbank and C. F. Torrey. Shipping and dock interests are, therefore, thoroughly represented and it may be assumed the new body will have a good start. For the present it is understood the administration will continue to be from Dock House and matters concerning the river from the Thames Conservancy Offices on the Embankment. The new body consists of thirty members, Mr. Phillipson, the Secretary of the Thames Conservancy being appointed the temporary secretary of the Authority until the permanent appointment is made. On this, the inaugural meeting, not one member was absent from hearing the chairman's statement, which was a *resumé* of the past history of the port, its present position and future possibilities. A committee of organization was appointed, including the Chairman and eleven other members.

Dock Co.'s Meetings.—In view of the transfer the Dock Co.'s meetings become of special interest. The chairman of the London and Indian Dock reported only a slight falling off in the returns of the last two months, and an increase of tonnage in their own docks of 61,000 tons last year. In the accounts, after paying interest and dividends on preference stocks, £2 18s. 6d. per cent. was paid on the deferred ordinary shares. At the Millwall Dock meeting, the tonnage for last year was given as the largest ever handled, *viz.*, 1,175,687 tons. The profits for the year showed an increase of £3,714, and £2 10s. per cent. was the dividend. It will be noticed, therefore, that in both these Companies the business is a flourishing one at the termination.

Chamber of Shipping.—The annual meeting of this body has been held in London under the presidency of Mr. C. E. Brightman, who described the trade for the past year as the worst on record. The new Port of London authority was referred to with approval, and references were made to the cost of lighting and the unfairness in many cases of the working of the Compensation Acts.

Steamship Lines.—The P. and O. and Orient Companies figure importantly with their new boats, the former company with the launch of the *Mantua* at Messrs. Caird & Co.'s, which is said to be the last of the additions proposed by the owners. Of the five boats of the Orient Co., three, the *Orsova*, the *Osterley* and the *Otway* are already launched. With the three of the P. & O. Co. there will therefore be engaged in the Australian trade from London, eight of the finest vessels ever employed in this service.

London's Bridges.—Blackfriars' Bridge widening, a considerable engineering work, has reached a stage when the chief difficulties have been overcome. The new piers have been tested for weight to ensure that the stability of the whole bridge is secured. The face ribs of the old bridge have been removed 30 feet westward. There are four of these and each is 200 feet long, weighing 150 tons each, so the undertaking was no mean one. The girders to carry the new roadway will now be laid down and the completion be a year hence if all goes well.

SOUTHAMPTON.

(From our Own Correspondent.)

Messrs. Day, Summers & Co., Ltd., Northam Ironworks, have completed the plating of the 226-ton steam yacht for Col. Gascoigne, and the engines and boiler are all ready for fitting aboard. She will be launched early this month. Extensive alterations are in progress on the paddle steamer *Emperor of India*, owned by Messrs. Cosens & Co., of Weymouth. The fore part of the vessel is being plated up and the promenade deck extended to the stem.

The following vessels were slipped last month:—S.Y. *Hildegarde*, owner Mr. Illingworth, which afterwards had small repairs to engines; ss. *Princess Beatrice*, *Lord Elgin*, *Bournemouth Queen* and the tug *Vulcan*, all belonging to the Isle of Wight Steam Packet Company. The ss. *Duke of Normandy*, belonging to the Jersey Harbour Board, also had new furnaces fitted to her boiler.

Two slipways, one for Port Sudan, of 1000 tons capacity, and another for Cadiz of 950 tons, are now almost completed, and the former will be shipped to its destination early this month.

Messrs. J. I. Thornycroft & Co., Ltd., Woolston Works.—*H.M. 1st-class T.B. 32.* This vessel successfully passed her electrical trials and was afterwards dry-docked for final survey and painting, after which she was handed over to the

Admiralty. H.M. T.B.D. [illegible]. The hull work on this destroyer is now complete. Ss. [illegible] and the *Paso-de-San Lorenzo* are both fitting out at the jetty in readiness for the voyage to South America, and are expected to leave early this month. They complete the order for five similar vessels for river service. *Steam tug and passenger flat for Chinese Rivers.* These two vessels are being packed for shipment. The 27-knot destroyer *Savage*, for the British Admiralty, is rapidly advancing, and the keel was completed early last month. The steam yacht for Lord Leith is being proceeded with, and the details are now going through the works.

The steamer *Loyal Briton*, owned by Messrs. Gibbs & Lee, of Cardiff, was docked here for survey last month in consequence of extensive damage sustained owing to the vessel grounding on the 18th November last at Calabernado Noto, Sicily, during a very severe sirocco gale. About fourteen firms from all parts of the country submitted tenders for the repairs, but we believe only one local firm tendered. We understand the five lowest tenders, including the local tender, were all within £200 of each other. The tender of Messrs. W. Gray & Co., of West Hartlepool, was accepted, and the vessel proceeded north about the middle of last month. Previous to the vessel arriving at Southampton she was docked at Malta for temporary repairs, which consisted of a temporary rudder post which had been constructed of heavy angle irons, bolted to the broken part of the stern frame at the top, and carrying gudgeons for the rudder. Also a horizontal plate was carried out from the hull to complete the propeller aperture, and to which the angle irons, previously mentioned, were attached at the bottom. The stern frame was broken just at the forward bottom radius, where it left the shell plating, and at the top after part under the counter. The whole of the bottom, as far up each side as the bilge keels, was very badly indented and requires renewal. The *Loyal Briton* was built in the year 1904 by Messrs. J. Blumer & Co., Sunderland, and has a tonnage of 2259 tons (gross).

The Parsons Motor Co.—An order has been received for a three-cylinder standard pattern 21-h.p. engine for a 32 ft. cruiser built by Messrs. Saunders, of Cowes, Isle of Wight, and the engine is now being installed. The firm's reverse gears are being supplied to Messrs. Godden & Sons and Messrs. Matheson & Co., and others to replace gears previously in use. Several orders for their patent clutches are also going through the works. A specially light clutch is being made for a 60-h.p. engine for a Monaco racer, which Messrs. Saunders are building. A 60-h.p. engine and propeller set with reverse gear is completed, ready for installation in a fishing boat for the East Coast, and negotiations are in progress for two similar installations, and it is expected that the orders will shortly be booked. The new pattern Parsons water-cooled silencer is going through the works in large quantities, also a number of orders are in hand for separate parts of outfits, such as propellers, gears, universal joints, pumps, etc.

Messrs. A. B. Collis, Ltd., Engineers and Launch Builders Quay Side, Bitterne Park, with which is incorporated the Liquid Fuel Engineering Co. (late of Poole, Dorset), are just completing a high-class double-skin steam launch to the order of Messrs. Swan, Hunter & Wigham Richardson, Ltd., for the ss. *Simcoe*, which they are building to the order of the Canadian Government. The following are also in hand :—A 24 ft. liquid fuel steam launch to the order of the Scottish Lighthouse Commissioners as tender for the ss. *Hesperus*. The launch is to be fitted with a 15-h.p. "Lifu" set, and the hull will be constructed with a double skin. A further order is in hand for a 25-h.p. "Lifu" set for a steam launch for the Royal Mail Steam Packet Co., also there will shortly be launched a 50 ft. steel launch tug intended for service in foreign waters. Repairs have been executed to the following :—"Lifu" launch belonging to s.y. *Erin*, owned by Sir Thomas Lipton, Bart. ; s.y. *Agatha*, owner Sir Walter Green, also to the "Lifu" launch recently supplied for a tender to the *Dunottar Castle*, which has been chartered for cruising by Dr. Lund. The 28 ft. motor launch which the Company exhibited and sold at the Olympia Show, has been fitted with a cabin. This launch is built of mahogany and fitted with G.M. fittings throughout.

Messrs. Summers & Payne, Ltd., Belvidere, Northam.—The schooner yacht *Vera* was lately fitted with the Bergius system of folding side propeller and a Kelvin motor, and the installation has given particularly good results. Already there are thirty-five vessels (yachts and fishing boats) equipped with the system ranging in size from 10 to 185 tons, and in every case the best results have been obtained. Under this system there is no deadwood to bore and the propeller is working in solid water. The installation on the *Vera* comprises two 30 h.p. engines which maintain a steady speed of 6½ knots per hour. The fuel is paraffin and there is an entire absence of vibration or noise. The whole installation is stowed away in an engine-room only 8 ft. long, situated in the after part of the vessel. The engine-room is lead-lined and the bulkheads are thoroughly insulated thus preventing any possibility of the smell of paraffin reaching the owner's accommodation. The *Vera* is leaving shortly for a cruise to the Far East. Messrs. Summers & Payne have a 20-ton yacht with the Kelvin motor and Bergius folding propeller in their yard here for inspection of anyone interested. A handsome composite ketch rigged yacht of 135 tons is under construction for Sir Maurice Fitz Gerald (the Knight of Kerry). The deadwoods and planking are all of teak and the vessel is built to Lloyd's highest class. Under the name of *Julnar* she will race at Cowes for the King's and German Emperor's cup. The large steam yacht *Kethailes*, owned by Mr. Wm. Johnston, of Liverpool, is under orders to fit out also the *Grianaig* ; r.y.s. has left the yard for the Mediterranean and has since been joined by the Duke and Duchess of Westminster.

THE TEES AND HARTLEPOOLS.

(From our Own Correspondent.)

Middlesbrough Rolling Mills to be Re-Opened.—Arrangements have lately been completed for a resumption of work at Messrs. John Hill & Co.'s Rolling Mills, Newport, Middlesbrough. The mills, which are engaged in the production of iron plates, and find employment for about 600 men, have been closed down for two or three weeks, chiefly through slackness in trade. The firm is one of the largest producers of iron plates in the North of England, and had been working very irregularly for some time prior to closing down. As to the continuance of the mills, much, of course, depends on the state of trade

Dispute at Cargo Fleet Steel Works.—The men employed in the finishing department at the Cargo Fleet Steel Works have gone on strike, owing to some alleged grievance. They have expressed a determination not to resume work until a settlement has been arrived at by their responsible officials. They are members of the National Steel Workers' Union, and their secretary is trying to arrange an interview with the management to discuss the matters in dispute. Should the strike last for any length of time a very large number of men will be affected. The shipyards at Middlesbrough and Stockton show little, if any, improvement in trade, except perhaps that they have lately secured two or three repair jobs.

Smith's Dry Dock, at South Bank.—Messrs. Smith & Co. are likely to be fairly well employed for the next two or three months, having booked several new orders for small craft.

Brighter Prospects in the Hartlepools.—The various legal formalities connected with Sir Christopher Furness's shipyard co-partnery scheme are now completed, and it will come into operation from the end of March, that having been fixed from various points of view as the most convenient time from which to date the new venture.

The Harbour Dockyard and the Middleton Shipyard are now in full swing, and we learn, moreover, that further orders for new ships have been booked, which will keep both yards well employed. There are already something like a thousand men engaged at the Middleton Yard, where all three berths are now occupied. In the No. 1 berth, the frames of a steamer have been erected, work is proceeding on the frames of the second vessel, and the keel of a third steamer is also laid. There is also an abundance of repair work at the yard. The s.s. *Daltonhall* is in the graving dock, the s.s. *Phyllis* and s.s. *Canadia* are both waiting their turn to go in, the two

dredgers of the Hartlepool Port and Harbour Commissioners are to be overhauled, whilst the s.s. *Florence* is being repaired at the quay. Other big repair jobs are also expected.

There is still a scarcity of work at Messrs. W. Gray & Co.'s yards, though it is good news to learn that they have just obtained a big repair job, namely, the s.s. *Loyal Briton*, which some time ago went ashore off Sicily. Since then it has been docked at Southampton, where temporary repairs have been carried out. There was keen competition amongst the leading ship-repairers in securing the order for the permanent repairs. The vessel will leave Southampton immediately for West Hartlepool, and it is expected that the damage will provide work for the repair squad for several weeks.

Richardsons Westgarth & Co.—Owing to the scarcity of orders for their iron foundries at Middlesbrough and Hartlepool, it is reported that Messrs. Richardsons Westgarth & Co., Ltd., may shortly have to close temporarily the Middlesbrough foundry in order to concentrate all this class of work at one centre.

Referring once more to the co-partnery scheme, it is said, that by the placing of orders for the twelve new ships, to be built in these yards and other orders that have been placed there, it will give work to between 6,000 and 8,000 workers in the shipyards, engineering shops and steelworks in this district. The South Durham Steel Co. expect to get orders for material worth from £120,000 to £150,000.

Strikes and Lock-outs to be foresworn.—The articles of association between Sir Christopher Furness and those who shall become employees under the profit-sharing scheme at the Hartlepools shipyards have now been published and make clear the exact basis on which the scheme is to be worked. Clause I of the schedule states that it is to apply to all skilled and unskilled labour, except casual workers. A workman employed by the Company for twenty-eight days consecutively shall cease to be a casual worker. Clause II. states that every employee must be a trade-unionist, and must if in the Company's employment on 31st March, apply within seven days after that date and accept an allotment of at least ten employee shares of £1 each in the Company. Employees may apply for more than ten shares, but the Company will not guarantee to allot any employee more than that number. If an employee-shareholder dies, or leaves the Company's employment by dismissal, or otherwise, a purchaser will be found for his employee's shares at the par value of the amount paid up thereon, and he will be indemnified from liability to pay any further sums on the shares. The four per cent. interest on these shares is secured by a personal guarantee given by Sir Christopher Furness, with, however, a proviso for "any sums paid under this guarantee of dividend being recouped to the guarantor out of subsequent profits." In the event of Sir Christopher's death, his estate will continue under the same liability, but in that case his representatives may, on six months' public notice, terminate the liability. It is a fundamental condition of this scheme that the employees give up their right to strike, while the Company give up their right to lock them out. The fact of any workman being a shareholder under the scheme shall not vitiate or prejudice his right in case of accident under the Workmen's Compensation Act, or otherwise. This is the reading of the tenth clause, which, with another of a merely formal character, completes an agreement, the results of which are likely to have a far-reaching effect on the conditions existing between capital and labour in this country in the future.

NAVAL COALING FEAT.—At Portsmouth on the [illegible] of March, a smart naval coaling feat, which is understood to establish a world's record, was accomplished. The battleship *King Edward VII.* took on board from a floating depôt 1451 tons in a little more than 3½ hours, by means of electrically-driven Temperley transporters. The Commander-in-Chief [illegible] congratulating the [illegible] at the coaling depôt on the smart evolution.

SHIPBUILDING ORDER.—Messrs. Yarrow & Co., Ltd., shipbuilders, Scotstoun, have booked an order for a high-speed triple-screw turbine yacht for an American owner. The vessel will be designed by Messrs. Cox & King, London

LAUNCHES AND TRIAL TRIPS.

LAUNCHES—English.

Torpedo Boats.—An interesting double launch took place on February 22nd, from the Hebburn Yard of Messrs. R. and W. Hawthorn, Leslie & Co., Ltd., when two first-class torpedo boats for the British Admiralty were successfully put into the water. Their dimensions are 185 ft. by 18 ft. 6 in. by 12 ft.; their displacement will be about 270 tons, and speed 26 knots. The propelling machinery will consist of turbines constructed at the St. Peter's Works of the firm, capable of indicating 4000 horse power. Steam will be supplied by two boilers of modified Yarrow type, burning oil fuel.

Unnamed Steel Screw Steamer.—On February the 22nd, there was launched from the yard of Messrs. R. Williamson & Son, Workington, a steel screw steamer of the following dimensions:—Length, 181 ft. 6 in.; breadth, 27 ft. 9 in.; depth moulded, 14 ft. 7 in., and designed to carry 1000 tons dead weight on Lloyd's freeboard. The vessel is built to the highest class at Lloyd's and will be propelled by triple-expansion engines, having cylinders 15 in., 25½ in. and 41 in. diameter by 30 in. stroke, steam being supplied by a large cylindrical steel boiler, 14 ft. 6 in. diameter by 10 ft. 6 in. long, working at a pressure of 160 lbs. The vessel has been built by the above builders, and if unsold on completion it is their intention to run her in the British coasting trade.

Harlesden.—On February the 22nd, there was launched from the yard of the Sunderland Shipbuilding Co., Ltd., a handsomely modelled steel screw steamer, built to the order of Messrs. J. & C. Harrison, Ltd., London. Length between perpendiculars, 365 ft.; breadth, 50 ft. 6 in.; depth, 29 ft. 6 in., having long bridge and poop, both of which are utilized for cargo. The vessel has been built under the special survey of Lloyd's, and will take their 100 A1 class as a spar-deck steamer with freeboard, and has two complete decks laid, which gives her a spacious 'tween deck all fore and aft. Accommodation is placed on the top of bridge for captain, officers and engineers, a handsome saloon in polished oak is also fitted there, on top of that accommodation a chart and wheel house are fitted with flying bridge on top. Most careful attention has been given to rapid loading and discharging, and also to the ventilation of holds, which is to the owners' special requirements; ten steam winches are fitted with ten derricks; a large mutlitubular marine type donkey boiler is also supplied, together with direct steam windlass with quick warping ends, and an extra large steam-steering gear. The deadweight carrying capacity of the vessel is 7300 tons with a proportionately large cubic capacity. The machinery is supplied by the North-Eastern Marine Engineering Co., Ltd., Sunderland, having cylinders 26 in., 42 in. and 72 in. by 48 in. stroke, steam being supplied by three large boilers working at a pressure of 180 lbs. per square inch, which are also built to the requirements of the Hamburg Board of Police. The vessel during construction has been inspected by the owners' superintendent, Mr. W. Crandell, of Messrs. M. Burls & Partners, London. Upon leaving the ways the vessel was most gracefully named *Harlesden* by Mrs. John Harrison, wife of one of the directors of the Company.

Tees-sider.—On February the 22nd, Messrs. Irvine's Shipbuilding and Dry Docks Co., Ltd., West Hartlepool, launched the handsome steel screw steamer *Tees-sider* for Messrs. The Tyne-Tees Steam Shipping Co., Ltd., Newcastle-on-Tyne. This vessel is beautifully modelled and is intended for the passenger and freight trade between the Tyne and London, calling at the Wear, the Hartlepools and the Tees. Her dimensions are as follows:—Length, 265 ft. by 35 ft. by 16 ft. 6 in. depth moulded, having poop 144 ft. and forecastle 44 ft., these decks being of steel sheathed with wood, and a 'tween deck is fitted in the fore hold for separating cargo. The vessel is built to the highest class under British Corporation classification, having cellular double bottom for water ballast all fore and aft, also in fore and after peaks. It is divided into six compartments by five transverse bulkheads. Accommodation for passengers is arranged in a midship house at the fore end of the poop, comprising large well-ventilated and lighted state rooms having two berths each, tip-up lavatories, etc., large dining saloon, pantry, baths, w.c.'s, etc. The dining saloon is tastefully decorated with a dado of Chippendale mahogany, the upper panels being white

and gold, the corridors, lobbies and the walls of the state rooms are of light oak. The officers' and engineers' accommodation is situated under the poop aft and is replete with all the latest improvements, having litosilo on the floors, with separate mess-room, pantry, etc. A promenade deck is formed amidships about 80 ft. in length for the passengers, the lifeboats and jetty boats being placed on this deck, and at the fore end is a large and spacious room for the captain, chart and wheel-house, with a flying bridge overhead. The crew, firemen and petty officers are housed under the long forecastle, with lamp rooms, paint stores, etc. Particular attention has been paid to the appliances for loading and discharging the vessel, there being four powerful steam winches and a 5-ton steam crane. The forward hatch is 52 ft. long and worked by powerful derricks with double winches from the mast at the fore end and by steam crane at the after end, sweeping well over each side of the vessel. In addition a steel derrick is placed on the foremast capable of lifting 13 to 15 tons. Double winches are placed at the after hatch, with powerful derricks for working the cargo out of this part, and all other derricks are suitable for lifting 5 tons each. The vessel having two boilers fitted in front of each other allows of double saddle backs being so arranged that the coal can be teemed direct into the bunkers without any trimming. A complete installation of electric light is fitted throughout, including signal lamps, binnacles and clusters, for each hatch, also electric bells for the first-class passengers as well as a complete outfit of oil lamps in case of emergency. The steam steering-gear is placed amidships, a powerful screw gear aft, and a quick warping windlass on the forecastle for hauling the anchors. The engines are being supplied by Messrs. Richardsons, Westgarth and Co., Ltd, Hartlepool, having cylinders 23½ in., 38 in., 64 in. by 42 in. stroke, steam being supplied by two large single-ended boilers at 180 lbs. pressure, working under Howden's system of forced draught and capable of drawing the vessel at a speed of 14 knots. Messrs. Wailes, Dove & Co.'s "Bitumastic" enamel was applied to the bunkers, fore and aft peaks. and cellular double bottom all fore and aft. The christening ceremony was gracefully performed by Mrs. Claude Pease, of Marske-by-the-Sea, a large company being present, including Mr. and Mrs. S. W. Furness, Mr. and Mrs. Claude E. Pease, Mr. and Mrs. D. Thomas, Mr. and Mrs. Christopher Forster, Mr. and Mrs. David Belford, Mr. and Mrs. A. S. Purdon, Mr. and Mrs. J. T. Harris, Mr. and Mrs. Thomas Jefferson, Mr. and Mrs. R. J. Thompson, Mr. W. B. van Haansbergen, J.P., Mr. Harry C. Furness, Mr. T. L. Kirk, Mr. G. Moody, Mr. J. F. Macdonald, Mr. J. Parker.

Drottning Victoria.—On February the 22nd, a somewhat uncommon type of steamer was launched from the Neptune Works of Messrs. Swan, Hunter & Wigham Richardson, Ltd. The steamer is intended to carry railway trains across the Baltic, and is remarkable for the length of voyage she will accomplish. Usually when trains are carried across arms of the sea the transit is but short; in this case, however, the voyage will take place from Sassnitz in Germany to Trelleborg in Sweden, a distance of no less than sixty-five nautical miles, across a sea which at times is very rough. The vessel is 354 ft. in length by over 50 ft. beam, and will be propelled by twin-screw triple-expansion engines supplied with steam from four large boilers working under Howden's system of forced draught. Messrs. Wailes, Dove & Co.'s "Bitumastic" enamel was applied to the bunkers, engine and boiler spaces, side trimming tanks and hollow bilge keels. The trains are carried on two tracks on the car deck, occupying nearly the whole surface of the deck. Above that are very luxurious rooms for the passengers, including smoking-room, lounge, special suites, etc. etc. Underneath the car deck are a large number of state-rooms for passengers who are not occupying the sleeping berths on the train; both first-class and third-class are provided for. The vessel has been designed to be very steady at sea and has unusually large bilge keels fitted to minimise the rolling. A large number of ring plates and screws and spring buffers are arranged to prevent the cars from moving when at sea. For safety in entering and leaving port a bow rudder is fitted as well as the stern rudder, and both are controlled by steam from the captain's bridge. The steamer has been divided into a very large number of water-tight compartments which, with the Stone-Lloyd bulkhead doors with which she is fitted, render her practically unsinkable. She is also to be fitted with a submarine signal installation. The ventilating and heating is ensured by an installation of thermo tanks, enabling fresh warm air to be forced into all the rooms in winter and fresh cool air in summer. It is intended that the vessel shall have a speed of over 16 knots per hour, which will enable her to make her journey between Trelleborg and Sassnitz within four hours. The vessel is being built to the order of the Royal Administration of the Swedish State Railways, who were represented at the launch by Mr. Klemming, their Assistant-Director General. Mr. W. Hok, naval architect, of Stockholm, under whose superintendence the vessel has been built and who is responsible for the design, was also present as well as Captain Ljungberg, who will take command of the vessel when she is completed. The christening ceremony was gracefully performed by Mrs. J. Denham Christie, of Tynemouth, and the vessel was named the *Drottning Victoria*.

Canada.—On February the 23rd, there was launched from the shipyard of Messrs. Cochrane & Sons, shipbuilders, Selby, a handsomely modelled steel screw trawler, the principal dimensions being 165 ft. by 26 ft. by 15 ft. moulded. The vessel has been built to the order of Joseph Huret, Esq., Boulogne, s/Mer, France, and will be fitted with powerful triple-expansion engines by Messrs. Amos & Smith, of Hull, having cylinders 15 in., 25 in., 42 in. by 27 in., with large boiler 15 ft. by 10 ft., 180 lbs. pressure. As the vessel left the ways she was gracefully christened the *Canada* by Mrs. Joseph Bourgain, of Boulogne, after which the company adjourned to the builders' offices where the customary toasts were given and responded to. Amongst those present at the launch were Mr. Huret, jun., representing the owners, Mr. Bourgain, of Boulogne, Mr. Wilson, chief Lloyd's surveyor, of Hull, Mr. Boyes, of Stockton, Mr. McCombe, and Mr. Ingham, of Hull, etc., etc. This vessel is the largest steam trawler yet built, and has been specially constructed for the Newfoundland Fishery, having large trawl winch to contain 1000 fathoms of warp on each drum, steam windlass, electric light throughout, insulated fish-room, and in every respect fitted up in the most up-to-date manner for deep sea fishing. This is the second large trawler launched this year by Messrs. Cochrane & Sons for Boulogne, the *Notre Dame des Dunes* launched a month ago being only 5 ft. shorter, and they have also a similar vessel in hand for Portuguese owners. Messrs. Wailes, Dove & Co.'s "Bitumastic" enamel was applied to the bottom, all fore and aft, ballast tanks, cabins, engine and boiler spaces, bunkers, fish-room feed tank, forecastle, store-room peaks, deckhouses, etc.

Kurow.—On February the 23rd, Messrs. Wm. Doxford and Sons, Ltd., launched from their yard at Pallion, Sunderland, the steamer *Kurow*, built to the order of the Union Steamship Co., of New Zealand, Ltd., London and Glasgow. The vessel is 315 ft. long, 44½ ft. broad, with a moulded depth of 23 ft., and is classed with the British Corporation Registry. Messrs. Wailes, Dove & Co.'s "Bitumastic" enamel was applied to the bunkers and their "Bitumastic" covering to the tank top in boiler-room.

Brugia.—On February the 24th, Messrs. Short Brothers, Ltd., launched from their shipbuilding yard at Pallion, Sunderland, the s.s. *Brugia*, built to the order of Messrs. T. Nolson & Co., for The Ghent Lloyd of Ghent. The vessel, which will take the highest class in Germanischer Lloyd, is 292 ft. in length, 41 ft. beam, and 20 ft. 7½ in. depth moulded, and will carry a cargo of 3600 tons on a moderate draught of water. She is constructed on the deep-frame principle, with one deck laid, long poop and topgallant forecastle, and the fore end is specially strengthened, enabling the vessel to steam through ice. Water ballast is provided for throughout the double bottom and in both fore and after peaks. Comfortable accommodation is provided for the captain with saloon handsomely panelled in polished hardwood, and for the officers and engineers in houses on the bridge deck, the crew being berthed in forecastle. Five steam winches, steam windlass, steam-steering gear amidships with rods and chains to quadrant and controlled from standards on upper and lower flying bridges, are fitted, all driven from a large donkey boiler in stokehold. Hand-steering gear aft fitted. The propelling machinery is by The North-Eastern Marine Engineering Co., Ltd., Sunderland, and consists of engines, with cylinders 21 in., 33 in., 55 in. diameter and a

stroke of 36 in., driven by two multitubular boilers working at 180 lbs. pressure. During construction the hull and machinery have been under the supervision of Mr. P. J. Goetbloet, of Antwerp. On leaving the ways the vessel was gracefully christened by Mrs. T. Nolson.

Kaministiquia. On March the 9th the *Kaministiquia*, a steel single-deck screw steamer, which has been built by Messrs. Swan, Hunter & Wigham Richardson, Ltd., for the Western Navigation Co., Ltd., of Fort William (Ontario), for service on the Canadian Lakes, was launched at Wallsend. She is of the following dimensions :—Length overall, 256 ft. ; breadth extreme, 43 ft. ; and depth moulded, 25 ft. She will be classed with the British Corporation. The propelling machinery, which is being built by the North-Eastern Marine Engineering Co., Ltd., Wallsend, consists of a set of triple-expansion engines, with cylinders $20\frac{1}{2}$ in., 33 in. and 54 in. in diameter by 36 in. stroke, taking steam from two single-ended boilers working at a pressure of 180 lbs. per square inch. On leaving the ways the vessel was named by Mrs. Stephen, wife of Captain Edward L. Stephen, who is superintending the construction of the vessel on behalf of the owners.

Magdalena.—On March the 8th, Messrs. Craig, Taylor and Co., Ltd., launched from their Thornaby Shipbuilding Yard, Thornaby-on-Tees, a handsomely modelled single-deck screw steamer of the following dimensions :—*viz.*, 298 ft. by 44 ft. by 21 ft. 1 in. moulded. She is built of steel to the highest class in Lloyd's, under special survey, and has poop, bridge, and topgallant forecastle ; water ballast in double bottom fore and aft, and in peaks. She is equipped with patent steam windlass with quick-warping ends, steam-steering gear, five steam winches, and suitable donkey boiler, pole masts and all the latest improvements for rapid loading and discharging. The accommodation for captain and officers is neatly fitted up in deckhouses amidships, the engineers being in deckhouse alongside engine casing, and the crew in the poop. Her engines have been constructed by the North-Eastern Marine Engineering Co., Ltd., Sunderland, the cylinders being 21 in., 35 in., 57 in. by 39 in., with two large steel boilers working at 160 lbs. pressure. The vessel has been built to the order of A. C. Lensen, Esq., of Terneuzer, under the superintendence of W. C. Cartor, Esq., of London. As she left the ways she was gracefully christened the *Magdalena* by Miss Lensen, daughter of the owner.

Hebe.—On March the 8th, there was launched from the yard of the Sunderland Shipbuilding Co., Ltd., a steel screw steamer, 257 ft. B.P. by 35 ft. breadth extreme by 17 ft. deep, having raised quarter deck, bridge and topgallant forecastle, built to Bureau Veritas highest clsas, under special survey ; the vessel will carry 2050 tons deadweight and is fitted with water ballast in cellular bottom and deep tank in after hold. Accommodation is placed partially on top and underneath bridge for captain, officers and engineers, the sailors and firemen are in forecastle as usual. The saloon is amidships, and is fitted up in polished hardwoods. Four steam winches, steam-steering gear and direct steam windlass are fitted. The engines are by the North-Eastern Marine Engineering Co., Ltd., Sunderland, and have cylinders $19\frac{1}{2}$ in., 32 in., and 53 in. by 36 in. stroke, steam being supplied by two large boilers working at a pressure of 180 lbs. per square inch. The vessel has been built to the order of Messrs. G. Lamy & Co., of Caen ; for whom the builders have previously constructed three steamers, and during construction has been inspected by Messrs. Swan & MacFarlane, Newcastle, and Mons. Halbique. On leaving the ways the vessel was gracefully named *Hébé* by Miss Grabham, of Gosforth.

Xelso.—On March the 9th, a handsomely modelled steamer, built to the order of Messrs. Thomas Wilson, Sons & Co., Ltd., was launched from the yard of Earle's Shipbuilding and Engineering Co., Ltd., Hull. This vessel is intended to augment the owner's Dantzic service and will shortly be put into commission. Her principal dimensions are :—Length, 250 ft. ; breadth, 35 ft. ; depth moulded, 18 ft. She has been built of steel to the British Corporation Registry's highest class and to the Board of Trade latest requirements. The vessel is of quarter-deck type with long bridge and forecastle, and will be fitted with two pole masts to suit Manchester Ship Canal regulations, and is capable of carrying a large quantity of water ballast. Deck-houses have been provided amidships for the accommodation of captain, officers and stewards. The engineers are berthed in bridge 'tween decks abreast engine casing and the crew in forecastle. She will be fitted with derrick posts and all necessary derricks and cargo gear, also four steam winches, steam windlass, steam and hand steering gear. The vessel, before leaving the ways, was named *Xelso* by Mrs. A. Lutze.

Yokohama.—On March the 9th, there was successfully launched from the yard of Earle's Shipbuilding and Engineering Co., Ltd., Hull, the finely modelled steel screw trawler *Yokohama*, which has been built to the order of Messrs. Pickering & Haldane's Steam Trawling Co., Ltd., Hull. The dimensions of the vessel are 136 ft. 8 in. B.P. by 23 ft. 6 in. ex., 13 ft. moulded. She is built for 100 A1 Class at Lloyd's under special survey, with scantlings in excess of their requirements, and is fitted with all the latest improvements in fishing gear, including steam windlass, turtle deck forward and stern hood and boat davits aft. The machinery, which is being supplied by the builders, consists of a set of triple-expansion condensing engines having cylinders 13 in., $22\frac{1}{2}$ in., 37 in. diameter by 26 in. stroke, and a large boiler working at a pressure of 200 lbs. per square inch. As the vessel left the ways she was named the *Yokohama* by Miss Frost (daughter of Captain Frost, who will command the vessel), and amongst those present were Mr. and Mrs. Welcome, Miss Wright, Mr. Frost and Mr. J. A. Sturrock (Earle's Co.).

LAUNCHES—Scotch.

Astarte.—On February 5th, the s.s. *Astarte*, steel screw steamer, single-deck type, 2100 tons deadweight, was launched by Messrs. Campbeltown S/B Co., for Messrs. J. N. Hutchison, Glasgow. Machinery will be supplied by Messrs. D. Rowan and Co., Glasgow. A Cochran (Annan) donkey boiler, with patent seamless furnace has been fitted.

Mantua.—On February 10th, Messrs. Caird & Co., Greenock, launched the twin-screw steamer *Mantua* for the Peninsular and Oriental Steam Navigation Co. The vessel, which is sister ship to the *Malwa*, launched from the same yard in October last, is of the following dimensions : Length, 560 ft. ; beam, 61 ft. ; depth to spar deck, 38 ft. 3 in. ; and of 11,500 tons. She has accommodation for 400 first-class and 200 second-class passengers. Her cargo equipment comprises all that is modern, including hydraulic gear for the silent working of the cargo, insulated holds for the Australian trade, and large insulated chambers for the passengers' provisions. The *Mantua* will be supplied by the builders with quadruple-expansion engines, capable of producing a high rate of speed. Messrs. Wailes, Dove & Co.'s " Bitumastic " enamel has been applied to the bunkers. Miss Bessie Caird, Stoneleigh, performed the christening ceremony, and the launch was carried through successfully. The *Mantua* was then towed by Glasgow and Greenock tugs to Messrs. Scott's fitting-out basin. She is expected to arrive in London in April, and is scheduled to leave the Thames on her maiden trip on July 16. All the boiler and steam pipe covering is being carried out by Messrs. Matthew Keenan & Co., Ltd., of London and Glasgow.

Ardmore.—On February 20th, there was launched from the yard of the Caledon Shipbuilding and Engineering Co., Ltd., Dundee, a handsomely modelled screw steamer, built to the order of Messrs. The City of Cork Steam Packet Co., Ltd., Cork. The vessel has been specially designed for the Company's passenger and cattle trade, and is of the shelter-deck type with a long upper bridge and top-gallant forecastle, and is of the following dimensions : Length, 272 ft. ; breadth, 36 ft. ; depth, 18 ft. 3 in. to upper deck ; depth, 25 ft. 10 in. to shelter deck. She is well equipped for the handling of cargo, having the following deck machinery, *viz.*, four steam cranes, warping winch and auxiliary donkey boiler. The passengers are accommodated in the upper bridge. There is also a handsome dining saloon and other necessary accommodation. The engines, which are of the triple-expansion type, have been supplied from the Company's Lilybank Engine Works, having cylinders 20 in., 33 in., and 53 in. with a stroke of 39 in., while steam is supplied from two large steel boilers working at a pressure of 180 lbs. A Cochran (Annan) donkey boiler with patent seamless furnace has been supplied to the above vessel.

Curlew.—On February the 22nd, Messrs. Wm. Simons and Co., Ltd., launched from their yard at Renfrew the last of three special service steamers which they are constructing to the order of the Rangoon Port Commissioners. The vessel as she left the launching ways was gracefully named the *Curlew*, by Miss Carris Anderton, daughter of Bailie Anderson, Renfrew, resident inspector over all three vessels. [illegible] tons deadweight carrying capacity, and are specially arranged for carrying stones and rubble across the Gulf of Martaban to Rangoon, in connection with the formation of retaining walls, etc., at the latter port. The vessel is propelled by one set of triple expansion surface condensing engines and large multitubular high-pressure steel boilers designed for burning inferior coal, and easily capable of supplying engines with steam for a speed of 10 knots. All the most modern auxiliaries are provided in the engine room, including steam and hydraulic reversing gear, independent pumps, feed heater, etc. A steam windlass is fitted forward and a steam capstan aft for mooring purposes. The hold for carrying the stones is divided into compartments and the discharge doors are controlled by steam appliances designed so that each compartment may be emptied independently of the others, or that all the compartments may be discharged at the same time. Spacious and well-ventilated cabins in teak wood are placed on deck for the accommodation of the officers, and of the official controlling the operations. The construction of the vessel, which is classed at Lloyd's, has been carried out under the direction of Messrs. P. W. and C. S. Moik, M.M. Inst. C.E., London.

Warrawee.—On February the 23rd, Messrs. John Reid and Co., Ltd., launched from their shipbuilding yard at Whiteinch, a steel screw passenger steamer which they have constructed to the order of The Gulf Steamship Co., Ltd., of Port Adelaide, South Australia. This vessel measures about 155 ft. by 27 ft., and will have machinery fitted by Messrs. Muir & Houston, Ltd., Harbour Engine Works, Kinning Park, Glasgow. She has been built under the superintendence of Mr. W. J. Woolnough, Govan, the company's representative. On leaving the ways the vessel was named *Warrawee* by Miss Wilcox, of Adelaide, daughter of the chairman of the company.

Duva.—On March the 5th, the Campbeltown Shipbuilding Co. launched the steel screw steamer *Duva*, built for Messrs. J. T. Salvesen & Co., Grangemouth. The vessel is about 2,100 tons deadweight and is of the single-deck type. The machinery is being supplied by Messrs. D. Rowan & Co., Glasgow, and a Cochran (Annan) donkey boiler with patent seamless furnaces has been fitted.

Sard.—On March the 8th, the Ailsa Shipbuilding Co., Ltd., launched from their Ayr Shipyard, a steamer to the order of William Robertson, Esq., for his well-known Gem Line. The vessel, which is intended for general coasting trade, is of the following dimensions: 142 ft. by 26 ft. by 12 ft. 3 in. moulded, built to Lloyd's 100 A1 class, quarter-deck type, and is designed to carry about 500 tons deadweight. She is equipped with all modern conveniences for the quick handling of cargo, and is fitted with self-trimming hatches, electric light, steam windlass, steam capstan aft, and steam steering gear. During construction the vessel has been under the superintendence of Captain Shaw. The machinery is being fitted by Messrs. Muir & Houston, Ltd., Glasgow; the engines are compound surface condensing, having cylinders 18 in. and 40 in. diameter by 27 in. stroke, with one single-ended boiler 14 ft. diameter by 10 ft. 6 in. long, working at 130 lbs., also donkey boiler 9 ft. 6 in. by 4 ft. 3 in. As the vessel left the ways she was gracefully named *Sard* by Miss Houston, Prestwick. After the launch the company adjourned to the Station Hotel for luncheon.

Aspromonte.—On March the 8th, Messrs. Archd. McMillan and Sons, Ltd., Dumbarton, launched the steel screw steamer *Aspromonte*, which they have built to the order of Mr. Walter F. Becker, of Turin and Genoa. The vessel is of the following dimensions, *viz.*, length, 394 ft.; breadth, 52 ft.; depth to upper deck, 26 ft. 9 ins., and has a complete shelter deck, which is sheathed all over with wood. The vessel is constructed with columns and girders instead of the usual hold pillars, thus leaving clear holds, while steel centre line grain divisions are fitted in all holds. Large water ballast capacity is provided for in cellular double bottom, aft peak, and in deep tank amidships. All up-to-date appliances are provided for the rapid handling of cargo, including steel derricks, etc., for heavy lifts. Accommodation is provided amidships on top of shelter deck for captain, officers, engineers and a few spare rooms, while the crew are berthed aft under the shelter deck. A Clayton Fire extinguishing and disinfecting apparatus is being installed and the vessel throughout is being finished in a very superior manner. The machinery is being supplied by Messrs. The Clyde Shipbuilding and Engineering Co., Ltd., Port Glasgow, and both vessel and machinery have been built to the highest class of Lloyds and Registro Italiano. During construction, the steamer has been under the superintendence of Mr. J. Baxter, of Newcastle-on-Tyne. The naming ceremony was performed by Mrs. W. M. McMillan, Dunvegan, Dumbarton.

The Duke of Cumberland.—On March the 9th, Messrs. Wm. Denny & Bros. launched at Dumbarton the *Duke of Cumberland*, a turbine steamer, which will prove a notable addition to the passenger fleet of the Irish Channel. She has been built by Messrs. Denny to the order of the London and North-Western and Lancashire and Yorkshire Railway Companies, and is for their Fleetwood and Belfast service. She will steam 20¼ knots. The *Duke of Cumberland* is 330 ft. in length, 41 ft. breadth, and 18 ft. depth. She is of the poop bridge and forecastle type and has a promenade deck above the main and lower decks. The propelling machinery consists of three sets of turbines supplied by steam from five boilers. The machinery and boilers are by Messrs. Denny and Co., and Messrs. Wailes, Dove & Co.'s "Bitumastic" enamel has been supplied to the bunkers, fore and aft peaks, ballast, trimming and engine and boiler-room tanks.

Norna.—On March the 9th, the fishery cruiser *Norna* was launched at Dundee by the Caledon Shipbuilding and Engineering Co., Ltd., the vessel having been built to the order of the Scottish Fishery Board. The *Norna* is a vessel 159 ft. in length, 25 ft. breadth moulded, and 14 ft. depth to main deck. She is finely moulded, and is expected to attain a high rate of speed, the vessel having been fitted out in a most complete manner. A powerful searchlight is arranged on a platform on the foremast, and the equipment includes a Kelvin utility motor launch of 7-9 H.P. The engines are of triple-expansion type from the Caledon Co.'s Lilybank Foundry. Lady Pentland, wife of the Scottish Secretary, christened the vessel, and Mrs. Carlaw Martin, Dundee, cut the cord launching the *Norna*. The visitors were entertained to cake and wine by the builders, and Mr. Grant Barclay proposed the health of Lord and Lady Pentland. In replying, Lady Pentland said the Scottish Secretary had intended to be present, but had been detained in London by duties of his office. Speaking in reply to the toast of "Success to the new vessel," Mr. Angus Sutherland, C.B., president of the Fishery Board, said the Caledon Company had made an excellent job in building the *Norna*. A Cochran (Annan) donkey boiler, with patent seamless furnace has been fitted.

Rio Grande do Norte.—On March the 9th, Messrs. Jarrow and Co., Scotstoun, launched the torpedo boat destroyer *Rio Grande do Norte*, the fifth of ten similar vessels, which the firm are building for the Brazilian Government. The naming ceremony was performed by Madame Rosauro de Almeida, wife of Captain de Almeida, chief adviser to the Brazilian Naval Commission. The destroyer is 240 ft. long and 23 ft. 6 in. beam.

Minderoo.—On March 9th, Messrs. Charles Connell & Co., Scotstoun, launched a steel screw steamer, named *Minderoo*, which they have built to the order of Messrs. Bethel Gwyn and Co., of London, for their West Australian trade. The vessel is also designed for the passenger trade, and has two decks fitted for carrying cattle. She has been built to Lloyd's 100 A1 class, and is fitted with all the latest improvements for the rapid and efficient handling of cargo, including special derricks and gear for heavy lifts. Machinery of the most recent type will be supplied by Messrs. Dunsmuir & Jackson, Govan. All the boiler and steam pipe covering in this vessel is being carried out by Messrs. Matthew Keenan & Co., Ltd., of London and Glasgow.

Mina Brea.—On March 10th, the Greenock and Grangemouth Dockyard Co., Ltd., launched from their yard in Greenock, the oil tank steamer *Mina Brea*, of London. The vessel is 373 ft. long, 49 ft. beam, and 29 ft. moulded depth. She is constructed to carry about [illegible] tons on a light draught

[illegible] was ordered by Messrs. Lane & Macandrew on behalf of William Keswick, Esq., of Leadenhall Street, London, and is being built under the supervision of Messrs. Flannery, Baggallay & Johnson, of London, Liverpool and Rotterdam, to have the highest class with Lloyds and to conform with the Suez Canal regulations, for carriage of petroleum in bulk. The machinery is being supplied by Messrs. John G. Kincaid and Co., Ltd., of Greenock, the engines having cylinders $25\frac{1}{2}$ ins., 42 ins., and 69 ins. in diameter, with a stroke of 48 ins. Steam is being supplied by three large main boilers with 180 lbs. pressure. There is a large donkey boiler, a powerful windlass, capstan, winches, etc., and the vessel is to be up-to-date in all respects, with a special view to the rapid handling of cargo. The propelling machinery is fitted amidships under a long bridge deck, and two pump rooms are fitted, one forward and one abaft amidships. The cargo pumps are fitted so that she will be able to discharge from any compartment on either side, and the pumps can be run at the same time on any two compartments and discharge at the same or opposite sides of the vessel. There will also be a complete electric light installation. The bunker capacity has been arranged with a special view to the vessel's trade, and the vessel is fitted for using both liquid fuel and coal.

Fair Isle.—On March 10th, Messrs. Hall, Russell & Co., Aberdeen, launched a trawler, which they have built to the order of Mr. James Inglis, Leith. The *Fair Isle* is 112 feet in length and 22 feet in breadth.

Fair View.—On March 11th, a steel screw trawler, built to the order of Mr. James Inglis, Leith, was launched from the shipbuilding yard of Messrs. Alexander Hall & Co., Footdee, Aberdeen. The dimensions are: Length, 122 ft.; breadth, 22 ft.; and depth, 12 ft. She is fitted with double-expansion engines of 360 H.P. and boilers of 180 lb. working pressure. The vessel was named the *Fair View*.

Hopper Steamer.—On March 11th, Messrs. Fleming and Ferguson, Ltd., Paisley, launched an 800-ton hopper steamer for South American owners.

LAUNCH—Irish.

Karoola.—On March the 9th, Messrs. Harland & Wolff, Ltd., Belfast, launched the twin screw steamer *Karoola*, built to the order of Messrs. McIlwraith, McEacharn & Co., Proprietary, Ltd., of London and Melbourne. The *Karoola* is 436 ft. long, 56 ft. 4 ins. beam, and about 7,500 tons. The vessel will have accommodation for a large number of first, second and third-class passengers, in addition to having large capacity for general cargo, horses and cattle, also large refrigerated cargo space. The passenger accommodation will be of a superior type, a special feature being the size and luxurious furnishings and decoration of the public rooms and state-rooms. The vessel will also have every facility for the rapid loading and discharge of cargo. The engines are of the builders' quadruple-expansion "balanced" type, and the ship will, of course, be lighted throughout with electric light. The launch of the *Karoola* serves to illustrate the close connection between the Mother country and the Colonies, as, although not intended to trade between the United Kingdom and the Antipodes, the *Karoola* will be engaged in what may in some respects be regarded as an even more important service, *viz.*, trading round the Coast of the great Island-Continent of Australia, the employment of such a fine steamer in that service being a significant indication of the great development in the trade and intercourse of our Australian Colonies. Mr. McIlwraith was present at the launch, also Miss McEacharn and Miss Madeleine McEacharn, daughters of the Hon. Sir Malcolm McEacharn, chairman of the owning company, whose intimate connection with Australia is so well known. During the construction of the vessel, the builders were assisted by Mr. R. E. Thomson, as inspector for the owners both of the ship and her machinery. As the vessel left the ways she was gracefully christened *Karoola* by Miss Madeleine McEacharn.

TRIAL TRIPS.

Legia.—[illegible] the [illegible] *Legia* lately launched by Messrs. Short Brothers, Ltd., left the Wear for [illegible] been built to the order of Messrs. T. Nolson & Co., for the Ghent Lloyd Société Anonyme of Ghent, is over 290 ft. long and carries a cargo of 3500 tons deadweight. She takes the highest class of Germanischer Lloyd and is specially designed with clear holds and large hatches for the timber and coal trades. The bows are specially strengthened to enable the steamer to frequent ice-bound ports in winter and ample water ballast is provided throughout double bottom and in fore and after peaks. Large deckhouses are built on the long poop deck, with saloon tastefully fitted in polished hardwood and captain's, officers' and engineers' rooms, the crew accommodation being arranged in the forecastle. Five steam winches, steam-steering gear amidships, controlled from standards in wheelhouse and upper flying bridge, and connected to quadrant tiller by rods and chains, steam windlass with quick-warping ends are supplied, all driven from a large donkey boiler fitted in stokehold. The cargo derricks have been specially arranged to enable the timber cargoes to be expeditiously handled, and in addition gaffs are fitted at heads of masts for coal or grain. The propelling machinery is by the North-Eastern Marine Engineering Co., Ltd., of Sunderland, and consists of engines with cylinders 21·33 in. and 56 in. diameter with a stroke of 36 in., taking steam from two multitubular boilers working at 180 lbs. pressure. On the trial runs the vessel maintained a speed of 10 knots. Amongst those present at the trial trip were Mr. and Mrs. Nolson, Mr. Joseph Short (managing director of Short Brothers, Ltd.), and other friends.

Therese.—On February the 19th, the steamer *Thérèse* was taken to sea for her trial trip. The vessel is a thoroughly up-to-date cargo steamer, specially built on the Wear for the coal, timber and iron ore trades, to the order of Mr. F. Bouet, Caen, France. Her dimensions are as follows:—Length, 250 ft.; breadth, 34 ft.; depth moulded, 16 ft. 6 in. Powerful engines have been fitted by the North-Eastern Marine Engineering Co., Ltd., Sunderland, the cylinders being 18 in., 30 in., and 49 in. diameter, with a stroke of 36 in., with steam supplied from two large boilers of 180 lbs. pressure. During a continuous and extensive trial of four hours, with the vessel fully loaded, a speed of 10·9 knots was easily attained, the engines working with great smoothness, and everything giving entire satisfaction to owner's representatives on board.

Astarte.—On February the 24th, the s.s. *Astarte*, of about 2200 tons deadweight, built by the Campbeltown Shipbuilding Co. for Messrs. J. & P. Hutchison, of Glasgow, ran trials at Wemyss Bay. The *Astarte* is of the well-deck type with raised quarter deck, bridge and topgallant forecastle, is built to Lloyd's highest class, and is arranged for timber and general trade. The machinery was supplied by Messrs. D. Rowan & Co., Glasgow. On the trial a mean speed of about 11 knots was obtained.

Eretza Mendi.—On March the 2nd, the handsome steel screw steamer *Eretza Mendi*, built by Messrs. Wm. Gray and Co., Ltd., West Hartlepool, for Messrs. Sota & Aznar, of Bilbao, was taken to sea for her trial trip. The vessel has been built to Lloyd's highest class, and is of the following dimensions:—Length overall, 377 ft; breadth, 50 ft. 3 in.; and depth, 37 ft. 10 in., with bridge, poop and topgallant forecastle. The saloon, state-rooms, captain's, officers' and engineers' rooms, etc., are fitted up in houses on the bridge deck, and the crew's berths in the forecastle, while in the poop accommodation is provided for a large number of cadets and a professor of navigation. The hull is built with deep frames, cellular double bottom and large aft-peak ballast tank. Six steam winches, steam-steering gear amidships, hand-screw gear aft, patent direct steam windlass, large horizontal multitubular donkey boiler, shifting boards throughout, stockless anchors, telescopic masts with fore and aft rig, and all the requirements of a first-class cargo steamer have been fitted. Triple-expansion engines have been supplied from the Central Marine Engine Works of the builders, having cylinders 27 in., 43 in. and 72 in. diameter, with a piston stroke of 45 in., and three large steel boilers adapted for a working pressure of 180 lbs. per square inch. The ship and machinery have been constructed under the superintendence of Mr. Goioochea and Mr. Undabarrona, and these gentlemen witnessed the trial on behalf of the owners; Captain J. E. Murrell represented the shipbuilders,

[illegible] Mr. Wm. [illegible] [illegible] builders. The vessel [illegible] knots. Everything worked with the utmost satisfaction on the run round to the Tyne, where the vessel takes in her first cargo.

Conch.—On March the 3rd, this vessel was taken on an [illegible] trial when she obtained a speed of [illegible] knots under loaded conditions. On the 13th March she was taken on a coal trial, so that the comparison might be made. This vessel is built by Messrs. Swan, Hunter & Wigham Richardson & Co., Ltd., Wallsend-on-Tyne, to the order of Messrs. The Anglo-Saxon Petroleum Co., Ltd., of Biliter Street, London, E.C. The ship and machinery have been superintended during construction by Messrs. Flannery, Baggallay and Johnson, of London, Liverpool and Rotterdam. Her dimensions are 312 ft. length overall, 51 ft. 5 in. beam and 31 ft. moulded depth. The engines are by Messrs. The Wallsend Slipway and Engineering Co., Ltd., having cylinders 26½ in., 43 in. and 72 in. diameter with a stroke of 48 in. The vessel is built for carrying oil in bulk and is specially fitted for carrying benzine, air extractors and other special means of ventilation being employed. Six runs were made on the measured mile under coal-burning conditions, and the result of these was a mean speed of 11·198 knots per hour. Oil pumps have been supplied and fitted on this vessel by Messrs. Hayward, Tyler & Co., Ltd.

Swift.—On March the 5th, Messrs. Cammell, Laird and Co., Birkenhead, put their new torpedo-boat destroyer *Swift* through further trials on the Clyde. Leaving the James Watt Dock at Greenock early in the forenoon, the vessel did not return to her berth till the evening, having spent nearly nine hours in the Firth. On this occasion the trials were more exhaustive than any which had previously been carried out by the torpedo boat. Her steaming test included six runs over the Skelmorlie measured mile, and the remainder of the day was occupied in cruising about the Firth for the purpose of further demonstrating the vessel's qualities. The weather was favourable to the attainment of a high speed, but, unfortunately, owing to a slight mishap to machinery her performances in this respect were discounted.

Herculaneum.—On March the 5th, the new steam tug, built by Messrs. John Cran & Co., Leith, for the Alexandra Towing Co., Ltd., Liverpool, ran trials on the Forth. Everything worked satisfactorily, and a speed of 12 knots was attained.

Fiona.—On Marth the 5th, the fine steel screw passenger and cargo steamer *Fiona*, built by Sir Raylton Dixon & Co., Ltd., of Cleveland Dockyard, Middlesbrough, with cantilever frames on the patents of Harroway & Dixon, John Priestman and Livingston & Sanderson, proceeded to sea for her official trials. This vessel has been specially designed and constructed to the order of the Colonial Sugar Refining Co., Ltd., of Sydney, N.S.W., to fulfil their special requirements for the conveyance of molasses in bulk and sugar from their mills in Fiji to their various refineries in New South Wales and New Zealand. The *Fiona*, which has been constructed under special survey to class 100 A1 at Lloyd's Register, and also has a Board of Trade Passenger Certificate, calls for more than passing comment, in so much that she possesses some of the most up-to-date appliances that engineering skill has been able to devise. Her leading dimensions are 373 ft. by 52 ft. 2 in. by 28 ft. 4 in moulded, and she has a measurement cargo capacity of over 10,400 tons and will carry a deadweight of over three times her nett register tonnage. As is characteristic of "Cantilever" framed steamers, the holds of this vessel, of which there are four, are perfectly self-trimming and absolutely free from all obstructions whatever. The topside tanks situated between the shell of the ship and the deck and the sloping sides of the holds are admirably suitable for the stowage of molasses in bulk. Part of these tanks will contain about 1000 tons of molasses, while the remainder will carry about 300 tons of water for trimming purposes. The molasses are run from huge cisterns at the mills into the topside tanks and are thus conveyed to the refineries, and by the aid of two sets of specially designed pumps fitted in the vessel the molasses are pumped from the ship into receivers situated on the wharf. The molasses are next forced from the receiver to the large storage tanks by a powerful air compressor fitted in the poop 'tween decks, the whole operation being performed in about eight hours. A large steel house is fitted amidships containing dining saloon and state-rooms, officers' accommodation with captain's cabin above and navigating room on top of latter. The engineers are accommodated in cabins at sides of engine casing, while the firemen are berthed in poop 'tween deck aft and crew in forecastle. In the poop 'tween deck is another large steel house containing the air compressor. In this room a special feature is introduced by the fitting up of Dr. Harker's patent fire extinguisher and fumigator, this vessel being the first on which the machine has been installed. Extensive trials on land have proved this apparatus to be most efficient, and its introduction on board ship is looked forward to with considerable interest. The common method of extinguishing a fire aboard a steamer is by the use of steam or by flooding the compartment affected, thus damaging the contents, while the Harker system abolishes all risk of damage to cargo by an ingenious arrangement of collecting the flue gas from the funnel, cooling and cleansing same, then forcing it under considerable pressure through pipes into the desired compartment, thus extinguishing the fire. The machine can also be used to disinfect the vessel and to destroy rodents and in addition can be utilized for the pumping of air throughout the ship. The vessel has unique facilities for loading and discharging her cargo, being equipped with three masts, ten derricks, eight gaffs, ten powerful steam winches with frictional ends by Clarke, Chapman & Co., with MacFarlane's patent clutches specially designed for rapid and economical working. She has also six water-tight bulkheads, four boats, lifeboats fitted with Welin's patent lowering gear, electric light throughout, including powerful searchlights, large refrigerating and cooling rooms aft. She has been fitted with engines, placed aft, by Messrs. North-Eastern Marine Engineering Co., Ltd., of Sunderland, having cylinders 26 in., 42 in. and 70 in. by 48 in. stroke, supplied with steam by three large single-ended boilers working at 180 lbs. pressure. During the trials, which passed off most successfully, there was on board a large party of experts interested in the development of this special type of vessel, and she proceeded to Glasgow under the command of Captain George Barnes to load. The design and construction of the hull and engines and the very special apparatus which have been installed on board this vessel have been carried out under the direct personal supervision of Mr. J. Pickering, M.I.Mech.C.E., of Baltic Chambers, 50, Wellington Street, Glasgow, the owners' consulting engineer in this country, assisted by Mr. A. McKinlay, as resident inspector, and Captain Barnes.

Lucigen.—On March the 6th, the steamer *Lucigen*, built on the Tyne to the order of Messrs. H. E. Moss & Co., for the Lucigen Steamship Co., Ltd., of which they are the managing owners, went for her trial runs. The vessel is 401 ft. long, 50 ft. 6 in. broad, with a depth of 33 ft. 9 in., and carries about 6500 tons of oil, besides bunkers, etc., on a moderate draught of water. The vessel is constructed and sub-divided so as to carry various descriptions of oil without fear of intermixing, and is provided with two pump rooms and double pumps for discharging the cargo either amidships or over the stern. A complete installation of electric lighting has been fitted, together with all the latest improvements in deck machinery. The propelling machinery has been constructed by the North-Eastern Marine Engineering Co., of Wallsend. The engines have cylinders 26 in., 43 in. and 72 in. in diameter by 48 in. stroke, steam being supplied by four large boilers at 180 lbs. pressure. A successful trial was carried out during very stormy weather, notwithstanding which she attained a mean speed of 11·7 knots, on a six hours' continuous trial, everything working satisfactorily. The vessel is classed 100 A1 under special survey at Lloyd's, and she has highest class in Bureau Veritas. Amongst those present at the trial were Mr. H. A. Cohan, Mr. W. M. Cohan, Mr. J. J. Atkinson, Mr. H. E. Lang and Captain A. Murray, who takes command of the vessel. Mr. D. Myles and Mr. Daglish represented the North-Eastern Marine Engineering Co.

Espadarte.—On March the 11th, this powerful new tug ran her official trial on the Tyne under adverse conditions, but obtained the very satisfactory speed of 11·852 statute miles per hour with 140 revolutions of the engines and steam blowing off all the time. One of the features of the construction that largely assisted in the success was Pollock's patent stern frame, which minimises the friction of the propeller and adds largely to the towing and speed efficiency.

The turtle back fitted forward indicates that the vessel is to be prepared at any time for rough sea work. To-morrow she sails for Portugal. This successful little vessel was designed and constructed by Messrs. James Pollock, Sons and Co., Ltd., tug specialists, 3, Lloyd's Avenue, London.

Netravati.—During the week ending March 13th, the trial trip of the steamer *Netravati*, built at the Grangemouth yard of the Greenock and Grangemouth Dockyard Co., took place on the Firth of Forth in extremely tempestuous weather. On the measured distance between Inchkeith and Oxcar Lighthouses the vessel attained a mean speed of 14 knots, being at the time fully loaded with 1900 tons of coal and bunkers, and in spite of heavy seas and a gale of wind. During the trial, although heavy seas were running, she proved herself a splendid sea boat, and the speed attained was over a knot above the contract. After receiving the balance of her stores the *Netravati* sailed for Bombay under the command of Captain Flanders.

Oder.—About March 16th the steamship *Oder*, recently launched by Messrs. Ramage & Ferguson, Ltd., for Messrs. James Currie & Co., ran her official steam trials on the Firth of Forth. The results were in all respects satisfactory, and the vessel sailed afterwards for Konigsberg.

H.M.S. Temeraire.—The steam trials of H.M.S. *Téméraire* have recently been completed. The *Téméraire* is the third vessel of the "Dreadnought" type, and she embraces all the features that experience has shown to be desirable. She was built in Devonport Dockyard, and is 490 ft. long, 82 ft. wide, 27 ft. mean draught, 18,600 tons displacement, while the i.h.p. necessary to drive her at the designed speed of 21 knots per hour is 23,000. On trial both the power and the speed desired were excelled, the vessel proving to be remarkably easily driven. The propelling machinery, with boilers complete, has been constructed by Messrs. Hawthorn, Leslie and Co., Ltd., at their St. Peter's Works, Newcastle-on-Tyne. The machinery is of the turbine type, in accordance with the Hon. C. A. Parsons' patents. It was arranged for driving four screws, while the boiler equipment consists of an installation of the latest improved large tube Yarrow type boilers. The trials consisted of a thirty hours' cruise at low power; a thirty hours' trial arranged so that the machinery might be tested at various powers, ranging from the lowest to over 12,000 h.p.; a thirty hours' trial at seven-tenths the maximum power; and an eight hours' full speed trial. During the whole of this steaming the engines and boilers worked without a hitch, and the results obtained have been of a very gratifying nature, the Admiralty overseers being highly satisfied. In addition to these trials, exhaustive stopping, starting, steering and astern trials have been successfully completed, and the vessel has returned to the dockyard for the purpose of making preparations for gunnery tests, which will, it is anticipated, take place in about a fortnight's time.

REVIEWS.

Water Hammer in Hydraulic Pipe Lines. (A. H. Gibson). 5/-. Archibald Constable & Co., Ltd., London.

THE above is a particular account, both theoretical and experimental, as to the rise and fall in pressure in a hydraulic pipe line and thereby covers a subject which in pipe lines is still being discussed in certain journals. We understand that though many books are at present extant dealing with hydraulics, there are no books at present dealing with this subject of water hammer, which follows the acceleration and retardation of a water column. In this small volume we have after the first introduction of gradual closure and the effect of a stand pipe on speed regulation, the theory properly set out as to the sudden stoppage of motion in the water. Then experimental particulars are given of tests upon the sudden closure or the sudden opening of an admission valve, as regards the wave of sudden pressure which is thereby set up. We find in an appendix relative statements of the rise in pressure as calculated, compared with the results obtained by experiment, which mutually agree.

Les Flottes de Combat in 1909. (Commandant de Balincourt). Berger Levrault & Cie., Paris and Nancy.

We have before us the present edition of this excellent little publication, which gives us a general view of all the various navies of the world. We find some of the old forms of vessels have disappeared and some new ones are included, which will serve to give the reader a general idea of the navies of the world in the form only of those that may be looked upon as liable to be found in the line of battle. As regards our own vessels, we find the *Dreadnought* with seven others placed under the same heading, in which the new qualities as to armament, with the dimensions of the hull properly set out in a drawing, are fully dilated upon. The ten 12-inch guns are shown in the drawing in their respective turrets, so that anyone can see that this has now become the most formidable ironclad of the British Navy. As regards Germany, they are credited with advancing this year in a manner which is both secret and feverish. Two *Nassaus* of 18,000 tons have been launched, whilst five others are ordered, with the guns and dimensions the same as the British *Dreadnought*.

Board of Trade Arithmetic (Peter Youngson). 3/-. James Munro & Co., Glasgow, and Messrs. Simpkins, Marshall, Hamilton, Kent & Co., Ltd., London.

THIS is a small work for the information of first-class engineers with sixteen papers given by the Board of Trade for first-class engineers. The questions are first put in a series, after which the solutions of the questions are given. This is a very useful and trim volume at a little price for easy perusal by the candidates. We see by the introduction that there is no necessity for the candidate to make up his answers to the Board of Trade correct to four decimal places. The author gives his statement that if the candidate is correct for two decimal places he will get full marks. As a result, the use of vulgar fractions for π and $\frac{\pi}{4}$ is recommended. Other cases of proportions are given with simple examples, and a practical method of working proportional sums is worked out, so as to reduce the labour of candidates. We regret, however, to point out that we notice an error between question 2 in Paper I. and the worked-out result, the multiplier being taken at 21 in the latter case, when the figure in the question is 25.

Reed's Engineers' Handbook. (W. H. Horn & Son). 14/-. Thomas Reed & Co., Ltd., Sunderland.

WE have before us the nineteenth edition of this work, which we find is a practically complete treatise for marine engineers brought up-to-date and completed as regards modern inventions, and with an additional satchel for mechanical drawings. We find Parts 1 and 2 have been left practically intact, as they have been found of the greatest use to young or backward students. Part III. we find to have been practically re-written, as the examples now agree exactly with the questions in the arithmetical papers, both for second and first-class engineers. It is to be noticed in the solutions entered here that everything in connection with the problems is fully explained so that a student can understand and carry in his mind the why and wherefore of the question, which cannot be done where the result is merely a definite arithmetical result, which must, therefore, be remembered. All the latest questions at the examinations have been now inserted in the present edition. Part IV. seems to be an entirely new feature, in which steam turbine engines and marine oil motors are particularly described. We see also that the sealing and salting of a boiler is particularly well described. The section V. in this part, relating to indicator diagrams, is considerably enlarged, some of those given being very carefully drawn and explained as to the particular faults to be found in them. Apparently a new section is given upon boiler strengths, in which details are set out in many worked examples. Part V. is very long and exhaustive as to the *viva voce* and written part of the examination and we find therein almost all questions and their replies, that could be given by the examiners. In the case of the drawing sets in the added portfolio, we find that many of these are re-drawn, the object of the authors being to set forth good, clear and well-dimensioned working drawings. These drawings are also accompanied by a book containing the statement sheets to be filled in by a candidate, where full instructions will be found for working out those parts where a little arithmetic is involved. We are glad to see that the authors of this handbook have set themselves out to make this edition most accurate and including all new and modern inventions.

The Marine Engineer
And Naval Architect.
LONDON, MAY 1, 1909.

TYPES OF WARSHIPS OMITTED IN RECENT PROGRAMMES OF NAVAL CONSTRUCTION.

A VERY interesting contribution by the Right Hon. Lord Brassey was read before the fiftieth session of the Institution of Naval Architects upon the types of warships omitted in recent programmes of naval construction. His Lordship commenced by remarking that it is in vain that Parliament should vote lavishly for the Navy if the money is ill spent, and therefore, if the errors of the past are to be avoided, it can only be by extreme care and unwearying study in directing shipbuilding policy. It is pointed out that warships building for every maritime Power are of the *Dreadnought* type, and such unanimity has been reached, not as the result of independent investigation, but by imitation of British designs. It is not inconsistent to contend that other types beside the *Dreadnought* are of great value for the line of battle, and in recent naval construction a continuous increase in dimension and in cost is apparent, there being three vessels later than the *Dreadnought* which, as compared with her tonnage, are increasing onwards to 20,000 tons, with probably a cost for construction of somewhere near £2,000,000. His Lordship quoted Captain Mahan as stating that when a certain speed has been attained a small increment must be purchased at a very great sacrifice. The sacrifice may be in gun power, armour, or carriage of coal, which are all obviously indispensable, or the choice must be for smaller numbers with larger individual power. Here the power of combination must be sacrificed. Upon this point the evidence of Sir Cyprian Bridge and of Sir Reginald Custance is quoted, which shows that it is the gun which is the main consideration, and that in the battle of Tsushima the fire of sixty-three guns was concentrated on the leading ships of the Russian line. The great principle of dispersing the guns to concentrate their fire was emphasized and confirmed. The author considers that if we were creating a new Navy for the defence of the British Empire it would be desirable to lay down a proportion of ships of moderate dimensions. He considers that the four armoured cruisers of the *Invincible* type, with a speed of 25 knots at sea, should be included in the *Dreadnought* class in any comparison of naval strength. The large protected cruisers are the least effective of all the ships in the British Navy List; they are too vulnerable to be reckoned as fighting ships. It is a waste of public money to keep such ships as the *Powerful* and *Terrible* in commission with their large crews. Regarding the *Dreadnoughts* as essentially ships for the open sea, it is now necessary that the naval experience and professional skill, which have made our fleets what they are, should be directed to the creation of a type especially designed for the inshore squadron. If this country is to keep ahead as a naval Power this cannot be done without further effort, the proportion of the amount voted for the Navy being only one-fourth for new construction, and is therefore not sufficient as compared with the monies voted for the navies of Germany and the United States when the proportions of those sums as applied to new construction is taken into consideration.

INTERNAL COMBUSTION ENGINES FOR MARINE PROPULSION.

THIS subject has been well dealt with in a paper read by H. C. Anstey, Esq., in which he claims for internal combustion engines economy in fuel, weight, and space. As regards the first item of economy it is generally conceded, but as regards the two latter affecting weight and space, there are very few data to be obtained, and it is to these points that the present paper is directed. The author points out that, as regards some noteworthy examples of small petrol engines with their large power for a small weight, this is due to the high speed of revolution and to the special use of materials of construction. He considers that the question of weight and space should be examined on broad mechanical principles. He finds that on investigation of steam engines for naval purposes he may express their weights by an expression such as $\frac{\text{I.H.P.}}{k} + k^1\frac{\text{I.H.P.}}{N}$ where N is the number of revolutions per minute. Then to apply this to internal combustion engines—in this case it must be remembered that there is only one working stroke in four—it would be found that the horse power per ton in an internal combustion engine will be $\frac{1}{32}$ times that of a steam engine of the same linear dimensions. He considers that, owing to the lighter accessories with higher possible speeds of revolution, this figure may be reduced to $\frac{1}{2}$, so that for engines of the same linear dimensions the horse power per ton will be about one-half of what it would be in a steam engine. A mechanical law of comparison has been set up, which is applicable to internal combustion engines, from which it is deduced that by comparison with a 4-inch cylinder of a petrol engine at 1200 revolutions, which will give 100 h.p. per ton, it will be found that in an engine of ten times the linear dimensions, the diameter will be 40 inches and the stroke 50 inches, the allowable revolutions will be only 120, and the horse power per ton will be only 10. A modern marine engine will give about

20 h.p. per ton, which brings the internal combustion engine to the same position as previously stated for it. This places the question of weight and space required for internal combustion engines in its true perspective, and the author does not anticipate any great saving can be effected.

INTERNAL COMBUSTION ENGINES FOR SUBMARINES.

THIS subject has been dealt with in a paper by F. R. S. Bircham, Esq., Associate. He commences by stating what may be considered as certain requirements in all submarine boats, such as silence when submerged, invisibility, safety and comfort of crew, and speed and radius of action for a given weight of machinery. The usual method of propulsion at present adopted is, generally, internal combustion engines when on the surface, and electric power when submerged. There are many advantages for this system with manifest disadvantages, such as the great total weight of machinery, following on the two separate systems of driving, the time involved in re-charging cells when exhausted with only a small radius of action and speed, and the dangers from injurious gases in using accumulators. He refers to the Del Proposto principle, in which a Diesel engine is used to compress air by a single cylinder when running on the surface, this cylinder being used as an air engine when the vessel is submerged, exhausting into the boat, and thus keeping the internal atmosphere fresh. This, however, brings into action the objection of visibility from the spray thrown up by the rising bubbles of exhaust products. Del Proposto, however, seeks to prevent this feature by allowing the engines at a critical moment to exhaust into the boat, as the crew can stand a gradual increase of pressure for some time. The author has a system allied to the Del Proposto principle, by which he claims that efficiency *is* increased. In this system the internal combustion engine is coupled to a multi-stage compressor, which, when the boat is submerged, is run as an air engine of multi-expansion type, the exhaust being used by the internal combustion engine, a part being turned into the boat to renew the air therein. The compressed air before use is re-heated by the exhaust of the internal combustion engine. With this system he claims to more than double the submerged radius given by electric power. Further particulars of the various oils used are given, and the author thinks that petroleum spirit can be used, if proper precautions are taken, in place of kerosene. Drawings and particulars are given of Thorneycroft and of White and Middleton engines for this purpose, which is a useful addition to the paper.

PROPULSION BY MEANS OF CONTRARY-TURNING SCREWS.

THIS subject has been dealt with by Lieutenant-Colonel G. Rota, R.I.N. member, in a paper in which he refers to the first introduction of two contrary-turning propellers on a common axis by Ericsson in 1839, which system has been followed in later years in the now well-known torpedoes of Whitehead and others. The method of driving these propellers when introduced was merely by reciprocating engines, but now-a-days the introduction of turbine engines has rendered this system more adaptable, as it is quite feasible to drive in opposite directions two shafts on a common axis without gearing or belt, which latter are not suitable for use on board ship. The author acknowledges his indebtedness to his Excellency the Minister of Marine in Rome for his permission to carry out a complete set of trials with a steamboat in the Royal Dockyard at Casettammare di Sabia, the results of which have been embodied in this paper. These results appear to be that about 20 per cent. of the horse-power can be saved, from which it may be deduced that a moderate ship, say of 10,000 tons, would save about 250 tons in weight of machinery employed to obtain a speed of 22½ knots, or, on the other hand, a knot more speed could be obtained with the same horse-power. The results of these experiments are concluded with an appendix giving the principal dimensions of the experimental vessel with details of the engine and boiler, and also particulars of the single screw and the double screws employed, either with uniform pitch or with an increased pitch for the forward screw as compared with the after screw.

DETERMINING THE THRUST OF PROPELLERS.

A NEW form of hydraulic appliance very simply applicable to a ship's ordinary shaft has been introduced by a paper read by J. H. Heck, Esq., member, in which it is shown that the thrust of a propeller could be measured with certainty, if one of the propeller shafts is utilised to form the ram of a hydraulic press, there being left a slight separation between any two of the shaft couplings. This is easily executed by enclosing the two flanges within a hollow cylindrical casing in which the shafting can revolve. Of course, suitable stuffing boxes must be used at each end where the shafting enters and leaves the cylindrical casing to make this latter water-tight, and the casing may be filled with water and put under pressure by a small hand pump. The pressure of the water must be determined by a suitable pressure gauge, or may be recorded by an indicator. The pressure of water finds its way between the faces of the enclosed coupling flanges, and when the pressure

is sufficient it will force out the portion of the shaft carrying the propeller against the thrust of the propeller and the friction of the shaft. When the water pressure has reached the balancing point it is then noted, and is then allowed to fall gradually, then at a lower pressure the thrust of the propeller will force the shaft back again, which must be noted, remembering that the friction of the shaft is included. It is then found that the thrust $T = \frac{P_1 + P_2}{2} \times$ area of shaft revolving in the bearings. The resistance F due to friction $= \frac{P_1 - P_2}{2} \times$ area of shaft. This has been checked in every possible manner, of which details will be found in the paper, so that the above are an absolute measure of the thrust and friction of a propeller.

TECHNICAL TRAINING OF MARINE ENGINEERS. — The proposals which are being made on the part of those who are specially interested in the scholastic and technical training of the marine engineer to qualify him for his duties and for passing the Board of Trade examination for a second engineer's certificate, are either too much on the side of the theoretical, or the promoters have given too little consideration to what is necessary for the possessor of a second engineer's certificate to know, and not only to know, but to express in clear language, before he is entrusted with a qualification entitling him to take full charge of a steamer's machinery under the Merchant Shipping Act. The object of the advocates of higher and compulsory technical education for junior engineers is an admirable one, and it must be admitted that with all the moral suasion and general encouragement offered to apprentices to take advantage of the opportunities placed within their reach, the percentage has hitherto been found disappointingly low; indications, however, have not been wanting that the percentage has been increasing during the past two years or so. It would no doubt tend to improve the situation were the acquirement of technical education made compulsory for all junior engineers before they are appointed to a position on the engine-room staff of a steamer. Many of the large companies have an entrance examination for applicants as juniors, in addition to which satisfactory evidence has to be submitted to show good and efficient workshop service, also evidence of technical study with certificates of examination. The examination is not, as a rule, an exacting one, and may be sufficiently elastic to admit the passage of a young man, desirable enough in other respects, but backward to some extent in the technics of engineering science. The desirability of instituting such an examination for all engineers before they can enter on duty in the engine-room is manifest, and would certainly be of advantage. The papers which were read before the Institute of Marine Engineers in 1892 and 1898, with the discussions which took place and the resolutions passed on the subject of the marine engineer and his qualifications, were in full accord with the view that the higher training and education of the engineer were most important considerations from an economic and national point of view. The resolutions passed by the marine engineers in 1893 advocated the introduction of a third engineer's certificate. This was considered by the Board of Trade, but not carried into effect, as it was in New Zealand and Australia, where, however, it has not been free from abuses, mainly from too much value being placed upon it. There is a qualifying education which nothing but experience can give, and the proof of possession lies in an examination. The preliminary examination before going to sea is good for a junior engineer, but he should not be tied down to any technical school or college, so long as he has the knowledge—however or wherever gained—and can pass the examination, but no junior engineer should be granted a second engineer's certificate without passing a further examination to test his qualifications and fitness for the higher position to which the possession of a certificate entitles him.

THE GREAT DOCK WORKS ON THE EAST COAST.

The Admiralty and The Humber.

FOR some considerable time past the Admiralty have been watching the great commercial developments on the Lincolnshire side of the Humber, and the authorities have evidently now come to recognise that Grimsby, occupying as it does a position practically at the mouth of the Humber, one of the gateways of the North Sea, possesses many advantages over other ports on the east coast of England for the establishment of a naval base.

At Immingham in a sheltered curve of the Humber just beyond Grimsby, the Humber Commercial Railway and Dock Company are engaged in constructing what is destined to be, not only the largest dock on the east coast, but also one of the finest docks in the world. Here the waters of the Humber are always sixty feet deep, and no matter what the state of the tide in the river outside there will always be a sufficient depth of water in the channel and dock-sills for the largest vessels in the world to enter or leave the dock at any time.

The works are of national importance, and the naval authorities are watching the undertaking very closely, for the past decade has seen such a change in North Sea maritime arrangements that an English east coast naval base must, it is thought become an ultimate necessity.

During the progress of the great manœuvres in the North Sea last summer, there were constant arrivals at Grimsby of torpedo boat destroyers, scouts and submarine boats, and it is thought that in addition to having arrived for stores and fuel in connection with the operations, the vessels came also for the purpose of acquiring a preliminary knowledge of the district preparatory to utilizing the Humber port as the home station of the east coast at some future date.

Naval experts frequently visit the dock works now in course of construction, a wireless signalling station has been established in the vicinity, and some time ago a hundred acres of additional land were acquired from the Earl of Yarborough for the purpose of constructing various extensions and a gigantic graving dock at Immingham, larger than the requirements of ordinary trade can reasonably be expected to warrant. When completed this repair dock will be one of the largest in the world, and capable of accommodating such battleships as the *Dreadnought* and liners like the *Mauretania*.

According to recent Admiralty arrangements, it is understood that flotillas of the new torpedo boat destroyers, which are now being constructed, will be stationed around the coast at various points of strategical importance, in connection with the scheme which the authorities have formulated for the better defence of our great commercial ports, and the first flotilla completed will be sent to guard the mouth of the Humber with a base at Grimsby. This arrangement would also seem to bear out the view that since the change of naval activities to the North Sea, the Admiralty have in mind the ultimate utilization of the port as a naval base.

It is now considerably more than two years since the first sod of the Immingham Dock was cut, and at the time it was estimated that it would take about seven years to complete it, but the progress in the work of construction is going forward with such amazing rapidity that the contractors confidently anticipate that by the summer of 1910 the great deep-water docks on the Humber will be declared open to the trade of the world.

The scheme provides for a great central dock from which are to radiate four smaller docks or arms, the whole to be approached by a large lockpit from the Humber. For the purpose of construction the Great Central Railway Company, who are really the promoters of the enterprise, have in all acquired nearly a thousand acres of land. The principal dock itself will be some forty acres in area, and when the extension docks are built in future years the water space will cover not less than seventy-one acres according to present arrangements. The remaining land is required chiefly for the extensive sidings which are to be constructed to cope with the great volume of trade which the docks will bring to the

Humber district from all parts of the world. There are to be no less than 163 miles of railway sidings converging to the southern extremity of the dock, where seven large coal hoists, each equipped with the most modern hydraulic machinery, are being provided.

The progress and development made are little short of phenomenal. More than one-half of the dock has already been excavated, and the lockpit, which is to be 450 feet long and 90 feet wide, and is to be equipped with hydraulic gates, is also about half built, and will allow of the largest vessels entering or leaving the dock at any time. Adjoining the dock two graving docks are being built, and the walls of these have already been constructed. The south-west wall of the principal dock, some 2350 feet long and built of concrete 25 feet in thickness, is practically finished, whilst the south-west arm or extension, 1250 feet by 350 feet, is also well advanced. An adjoining arm of the same area is being pushed forward with all haste for the benefit of the timber trade. The whole 2350 feet of the main wall will, it is expected, be available in less than eighteen months for coal and traffic. The entrance piers are being pushed forward at the same rapid rate, and one of them is built ready to allow vessels to be moored alongside. Preliminaries are also well advanced for the railway pier which will feed the coal hoist to be erected on the arm of the pier, where coal may be loaded on vessels lying in deep water.

The east side of the dock is already marked out for transit sheds and granaries, while applications have been received for the reservation of spaces for ship yards, engineering yards, timber yards, coal yards, factories, warehouses, etc. Vessels, it is expected, will bring timber from the Baltic and North European ports, and will load with coal for the outward voyages.

The proximity of Immingham to the south and west Yorkshire collieries and the coalfields of Nottingham and Derbyshire, will establish the place as their natural coal port. The Great Central Railway Company's system is directly connected with these centres, in addition to tapping the busy areas of Lancashire and Leicestershire, and by means of new lines now under construction the traffic will be borne straight to the docks, whence there will be regular sailings to the principal ports of Europe.

Whilst Hull will naturally be affected by the opening of the new docks, it is thought that the facilities which Immingham will provide will create an entirely new trade. A bold bid is also to be made to capture the Australian trade, so that the development of North Lincolnshire, and indeed the whole Humber district during the next ten years will be a matter for keen observation by the commercial world.

The light railway to connect Grimsby and Immingham is being pushed forward with all speed, and will be open to the public next June.

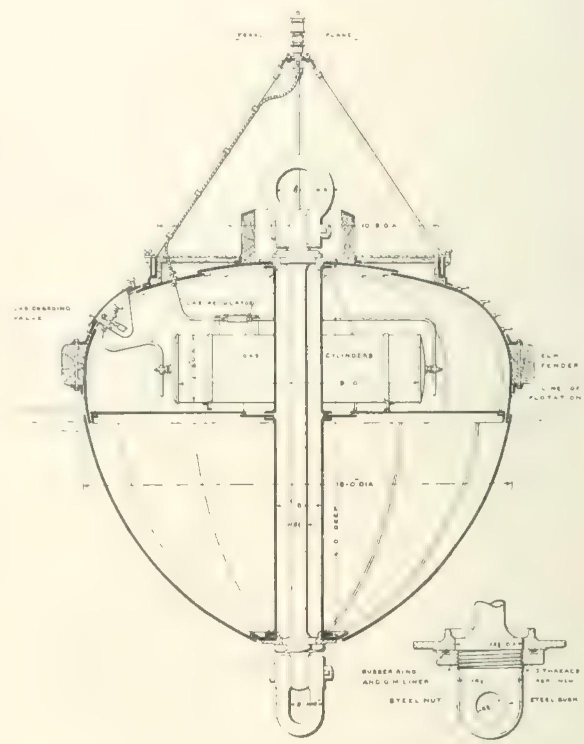
Captain Beaumont, the portmaster for Bombay, who is at the present time visiting Europe for the purpose of acquiring information respecting the construction of docks and railways, for the benefit of the promoters of a huge dock scheme for Bombay, recently visited the site and works at Immingham, and was greatly impressed by the vastness of the enterprise.

THE CUNARD LINE, from their headquarters in Liverpool, announce that the facts of the reported disablement of their express liner *Lusitania*, which has just arrived at New York, are that the vessel lost one blade of her after starboard propeller. It is singular that arrangements had already been made for the *Lusitania* on her return from this trip to go into dry dock to have both her three-bladed after propellers removed and replaced by four-bladed solid screws. A similar change previously made with the two forward propellers produced most satisfactory results.

THE BRITISH CONSUL-GENERAL at New York reports that the Liverpool, Brazil, and River Plate Steam Navigation Company will inaugurate in May a new express passenger service between New York, Rio Janeiro and Buenos Ayres. For this purpose the new vessel *Vasiri*, of about 12,000 tons gross, will be sent to New York early in May. The *Vasiri* is expected to make the voyage from New York to Rio Janeiro in about fourteen days.

BUOYAGE.

THE important functions performed by buoyage, both for mooring purposes, and particularly for marking channels, fairways and hidden dangers to shipping, cannot be overlooked, and in view of the increasing precautions that are taken to facilitate and render safe commercial navigation Messrs. John Bellamy, Ltd., of Millwall, London, E., an old-established firm of engineers and boilermakers, have for a long time considered and studied the design and construction of marking and mooring buoys, with the result that they have attained what is probably the most efficient and complete plant in the country for the execution of this particular work.



DETAIL OF BOTTOM JOINT OF MOORING SPINDLE

It is, of course, well known that the Corporation of Trinity Brethren—to whom Messrs. Bellamy have long contracted—are responsible for the existing standards of buoy-marker, whereby our mercantile shipping is rendered an immunity from danger that will not be found in any other country. This system of buoyage has been brought to such perfection that it has been adopted with scarcely any variation, not only throughout the United Kingdom, but practically all over the world.

The principal fixed marks as laid down by the Trinity Brethren are three in number—buoys showing a cone above water called conical, and denoting the starboard or right hand of mariners either going with the main stream of flood or entering a harbour, river, or estuary from seaward; buoys showing a flat top above water called can, and denoting the port or left hand of mariners; and buoys showing a domed

top above water called spherical, and marking the ends of middle grounds.

There are, of course, numbers of special marking buoys, such as the torpedo-shaped wreck buoy for marking the position of sunken wreckage, pillar buoys, spar, bell, gas and automatic sounding buoys used for marking special positions either along the coast or in the approaches to harbours, etc.

Buoys intended for mooring purposes vary as much in the design, which is dependent upon the speed of current, nature of haven and type of craft to be moored, as in size, which is naturally governed by the diameter of cable to be supported and the depth of water in which the buoy will swing. The mooring buoy, however, most easily picked up under difficult conditions, and therefore preferred by mariners, is the ordinary pear-shaped type, with plain round mooring bar through middle, rocking eye at top and swivel eye at bottom.

The buoy depicted in Fig. 1, which is probably the largest in existence, was designed and constructed by Messrs. John Bellamy, Ltd., to carry the abnormally heavy mooring chains required by the new twin Cunard q.t.s.s. *Mauretania* and *Lusitania*, and as in order to meet the requirements of the Mersey Port and Harbour Board it was found necessary to illuminate the buoy at night-time, Messrs. Pintsch's Patent Lighting Co.'s system of oil-gas light was applied, the lamp superstructure being made so light and socketed in so simple a manner that it could be disconnected and removed within a few minutes when a ship required to make fast.

The over-all dimensions of the buoy are 16 feet diameter outside plating and 18 feet diameter over fenders by 14 feet deep, and the complete weight is $16\frac{3}{4}$ tons. The displacement when coupled to the moorings, which consist of 16 fathoms of $4\frac{1}{4}$-inch stud link cable chain, is 865 cubic feet.

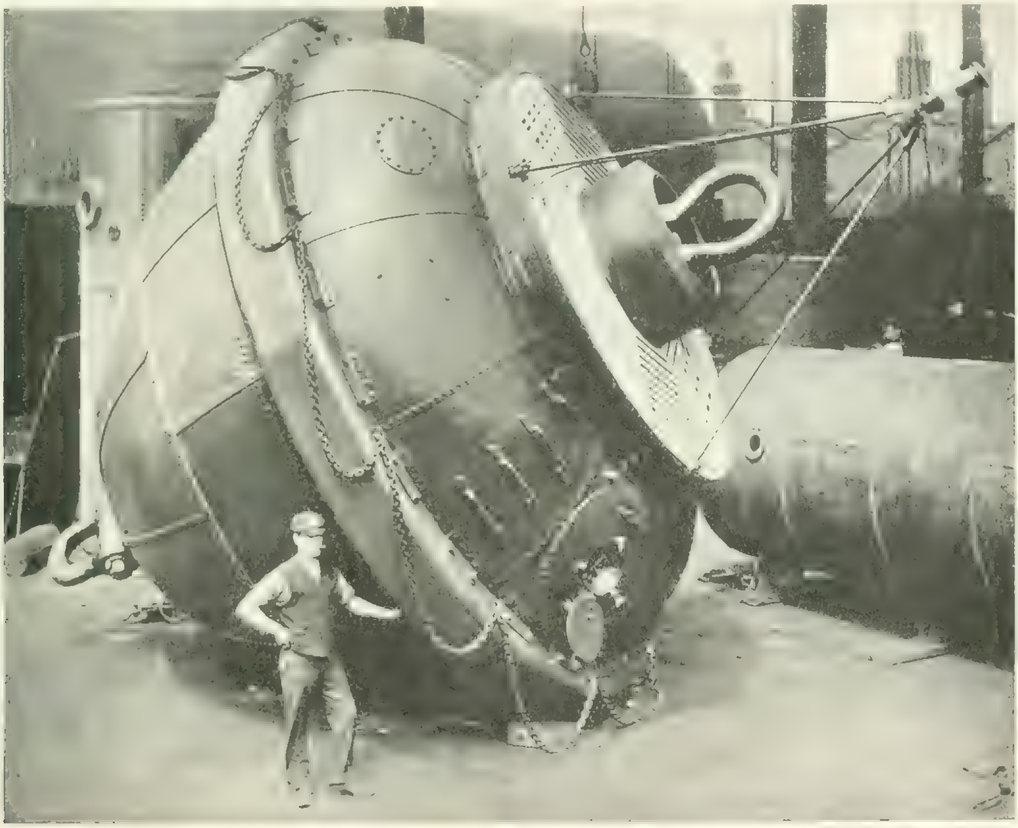


Fig. 1.

Holzapfels, Ltd., have sent us a list of vessels, British and foreign, coated by them during the period January to December, 1908, representing a total of 12,929,656 tons gross register. In addition large parcels of composition have been exported for use abroad.

THE IMPERIAL EXHIBITION is to be opened about the end of May on the site of the Franco-British Exhibition. It is expected that the engineering section will be representative of a good variety of machinery and appliances of special interest to all engineers. A committee embracing the different branches of engineering was appointed to co-operate with the management in order to secure attention to British industries connected with marine, refrigerating and general engineering, while the Congress Hall has been placed at the disposal of societies who have made application for it, with the object of arranging meetings of members for the reading and discussion of papers. The appointment of the committee was apparently not made at a date sufficiently early to give time for an adequate consideration of all the arrangements which might have been contemplated as to exhibits. We trust, however, that engineers will find their own peculiar section well represented.

A TWIN-HATCH STEAMER WITH CENTRAL DECK BALLAST TANK.

At present, when freights are so very low, the majority of shipowners are finding it extremely difficult to obtain even a small remuneration on the working of their vessels, and in many cases prefer to suspend working operations for a time, and lay their steamers up to avoid actual loss. Even assuming better times for the shipowner in the future, only those vessels which are carefully designed with a view to economy of working expenses and equipped with the most expeditious means for working cargo, can hope to be kept fully employed, as the quantity of tonnage available seems ever to be in excess of the demand, and especially has this been the case during the last few years. It is, therefore, imperative on the part of owners, as well as shipbuilders, to be keenly alive to any proposed improvements in the design and equipment of ships which from time to time are brought forward.

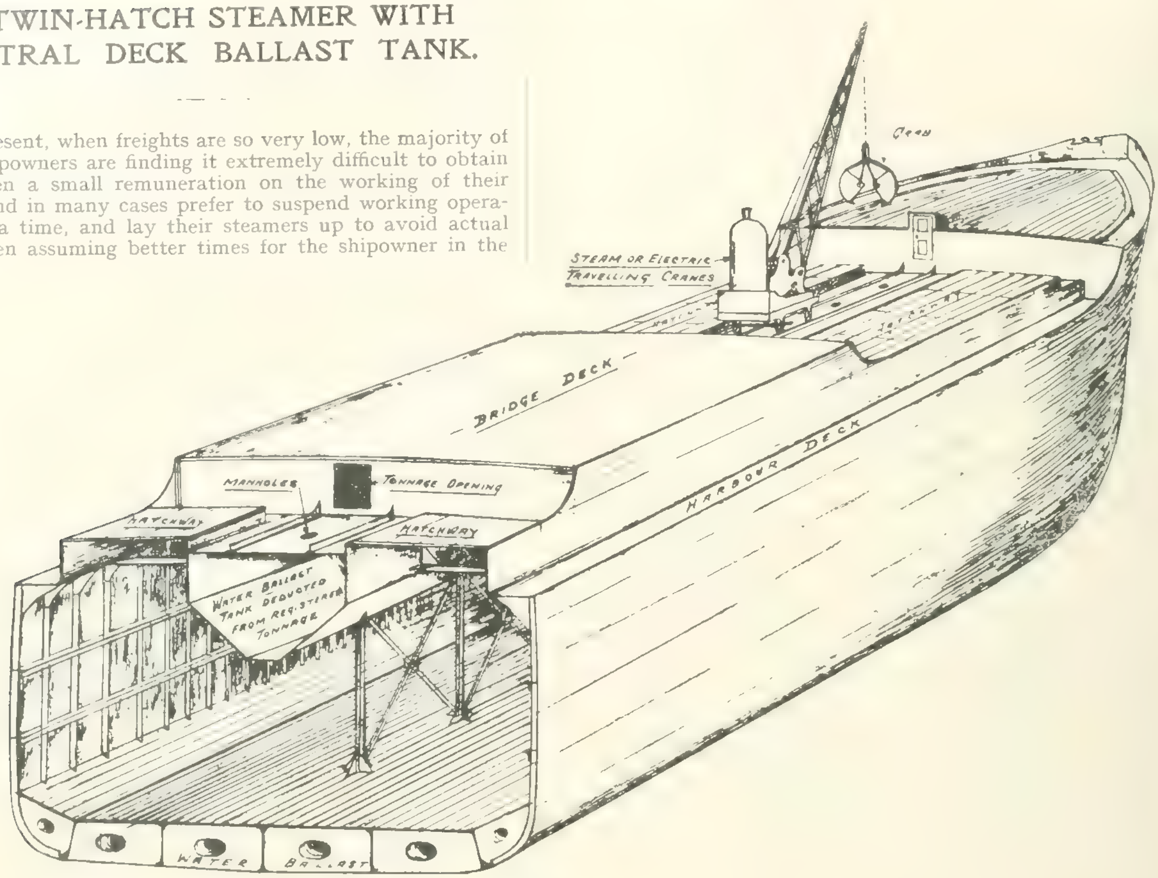


Fig. 1.

One of the latest patents relating to an improved ship construction, which we are about to describe, is the invention of Mr. E. W. Ashby, a Tyneside naval architect, whose aim has been to embody in a cargo vessel, costing approximately the same, or even less, than one of normal construction possessing equal deadweight capacity, several important advantages, tending to produce a better profit earner and a more valuable vessel having regard to the first cost.

Referring to the illustrations: Fig 1 represents the general appearance of the vessel, which in this particular instance is shown constructed with the usual deep framing and side stringers up to the deck, the most distinguishing feature being the arrangement of continuous side hatchways on the deck, having deep coamings extending unbroken between the poop, bridge and forecastle, or between the poop and forecastle when the machinery is placed aft. The outer coamings are fitted as close as possible to the sides of the vessel, consistent with strength. Between the inner coamings is situated the working deck of the ship, raised considerably above the ordinary deck level, leaving one foot or less of these coamings standing above. This deck is also continuous between the erections and can, if desired, be gradually sloped as it approaches the bridge or poop in order to get the necessary tonnage openings in the end bulkheads of such erections. Between the hatches and below this deck is situated a water ballast chamber extending down below the moulded depth level and having sloping sides meeting at the base. This tank, as will be seen from the drawings, is continuous forward and aft of the machinery space when such is amid-

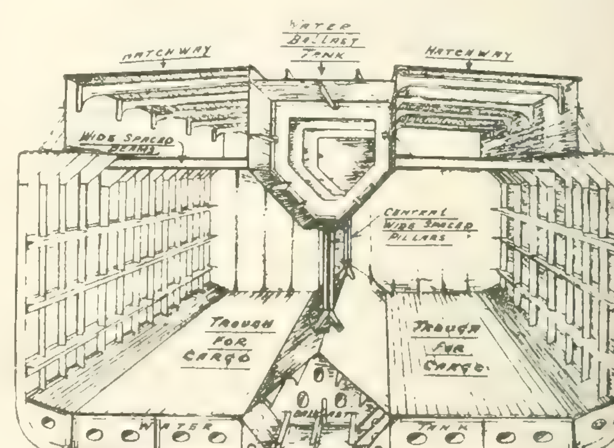
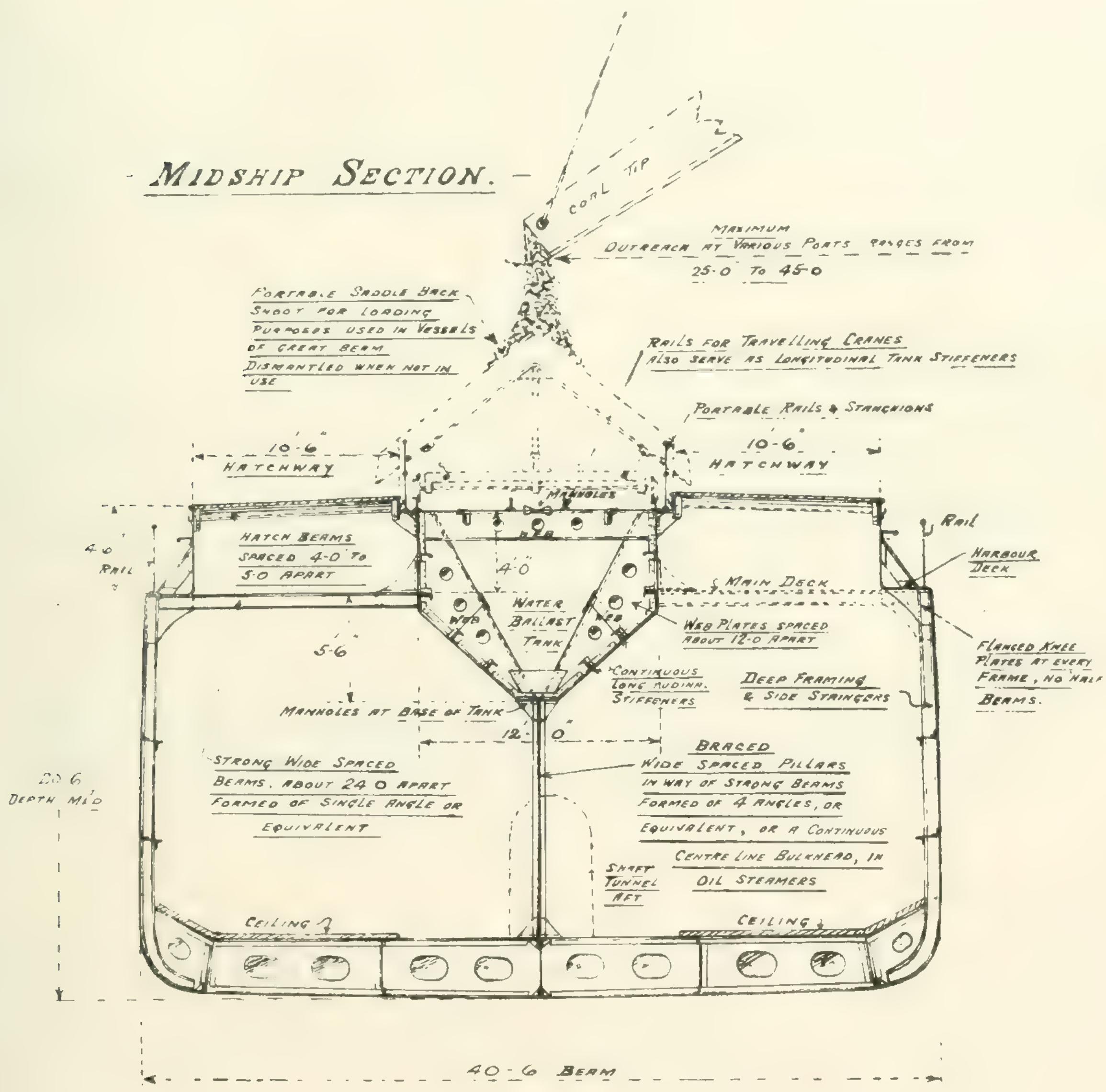


Fig 3

ships, the longitudinal strength being amply preserved by the bridge side and deck plating, extending considerably beyond the ends of the tank, and it will also be observed that the bridge sides are in line and continuous with the outer coamings of the hatches. On the central raised deck, instead

of the customary discharging gear composed of winches and derricks, etc., which, of course, could be fitted if required (and here it may be observed that this continuous and unobstructed deck is remarkably suited for the use of a line of shafting placed in fore and aft direction, having whipping drums mounted at regular intervals, a somewhat similar system being in use on more than one up-to-date collier). As a suggested improvement, however, it is proposed to use portable steam or electric cranes, moving along suitable be seen that to preserve the transverse strength at the deck strong beams are arranged at convenient intervals extending from the tank to the sides of the ship. These beams could be placed diagonally similar to the members of Warren Girder, in vessels designed to carry oil in bulk, preventing most effectually the increased tendency to work in such a ship, due to the nature of the cargo. Web plates are placed inside the tank to transmit the thrust, while the necessary support for same is secured by wide spaced strong pillars



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lines of rail attached to the deck, and arranged to work self-filling and discharging grabs. This equipment, in conjunction with the long hatches on either side, will enable bulk cargo, such as coal, to be discharged with a minimum amount of labour. The cranes would possess all the usual motions and be constructed with warping drums dispensing with the need of winches for manœuvring the vessel in harbour. The bollards, ventilators and other gear are also placed on this deck. Referring to the midship section, Fig. 2, it will braced in order to connect the tank rigidly to the remaining structure. A centre line bulkhead would, of course, be substituted in oil steamers, in which vessels the deck ballast chambers would be useful for trimming purposes or as auxiliary oil tanks. It will be noted that half beams are not necessarily required, the flanged beam knees being of sufficient size to efficiently support the small width of deck. At the top of the hatchways are placed the usual webs, spaced four to five feet apart, supporting the wood or steel covers. In a modified

arrangement which it is claimed would be specially adapted for the economical carrying and discharging of the heavier bulk cargoes, such as iron ore, coal, etc., a ridge is formed along the centre line above the double bottom, as shewn in Fig. 3, the enclosed space forming part of the double bottom, while the sloping sides serve as a saddle back for sliding the cargo directly underneath the hatchways, through which it can be raised without any hand trimming whatever being required; moreover, the space so enclosed will be deducted from the tonnage, and the further advantage of additional water ballast is gained. Figs. 4 and 5 show two arrangements of a steamer of handy size carrying about 3,000 tons deadweight, Fig. 2 being the midship section of same, while the group of three sections, Fig. 6 and the annexed table of data, compare the capabilities and advantages of the different arrangements of hatches and water ballast tanks. The particulars given have been carefully based on those of a vessel of normal construction, having the usual poop, bridge and forecastle, with two ordinary-sized hatches in each well, and is represented by type A, Fig. 6, types B and C being exactly similar vessels, with the exception of the differences indicated in the respective sections.

disposition of the ballast and its influence on the metacentric height and draught in ballast, as shown by the data given, should produce a steadier and more comfortable ship, when in such trim, and this without unduly taxing the strength of the vessel, as generally occurs when extra ballast is carried in a deep tank. Perhaps the most important advantage gained by this method of construction, viewed from the shipowner's standpoint, is the increased immersion allowed this type of vessel by constructing the deck ballast tank partly above the moulded depth level, which, in conjunction with the continuous side hatchways, forms a substantial erection connecting up the ordinary erections and giving extra strength and reserved buoyancy, so that with little increase in the weight of steel structure over that of the normal vessel (type A) a valuable reduction of the freeboard, and therefore a considerable increase in the deadweight capacity of the ship is gained, by the novel arrangement of the hatches and tank, amounting in this instance, it is estimated, to at least 300 tons of cargo. The point to be noted is that the additional cost of fitting the tank is more than counterbalanced by the resulting increase in the deadweight; furthermore, the tank when entered only by manholes is

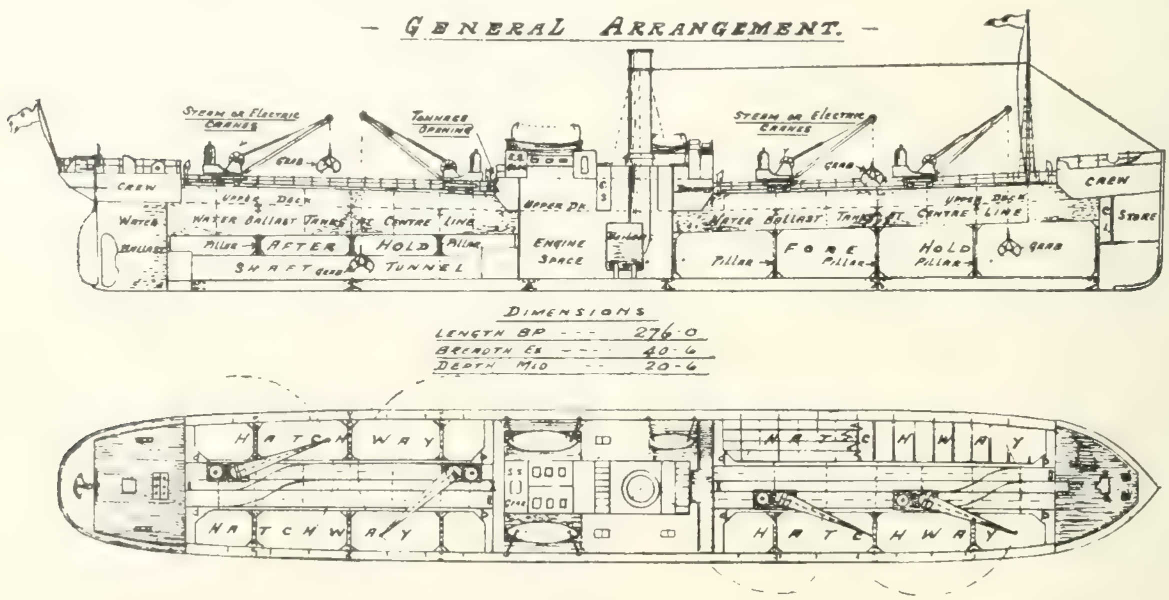


Fig. 4.

The advantages claimed for this construction tending to a relatively small cost, general utility and economy in working, are numerous. Considering, first, the structural arrangement the vessel has greatly increased longitudinal strength, due to a much larger percentage of the steel work at the deck being utilised in resisting longitudinal stresses than is ordinarily the case of steamers constructed with the usual hatches and winch platforms between same; moreover, the stiffening of the central tank longitudinally instead of transversely, as with side tanks, also adds considerably and economically to the longitudinal strength. This vessel, therefore, could be of much greater length to depth than usual without increased scantlings being required, for the otherwise necessary longitudinal strengthening, allowing the deadweight to be carried on a reduced draught of water relatively to that of a vessel of normal construction. The water ballast capacity is about equal to that secured by the same vessel, if constructed with topside wing tanks, about half of the total ballast being carried at the deck, and the compartment being arranged along the centre line of the vessel would prove free from straining and leakage. The actual capacity of the tank, of course, is to some extent governed by the width of hatches required. The

deducted from a ship's tonnage, so that by this arrangement *more deadweight per nett registered ton can be carried* than would be the case if the vessel was constructed as indicated by sections A and B. Also the tank being partly above the normal deck level does *not reduce the actual hold space to any great extent*, while *the total capacity, including hatchways*, etc., is considerably greater than in the other types, as seen on referring to the figures in the table.

Following from this system of construction is the formation of two trunks or feeders to the hold proper, enabling such a ship to carry full cargoes of grain in bulk and dispensing with the necessary bagging otherwise required by law, while the expense of fitting shifting boards at the centre line is reduced to about half, as the quantity required is necessarily small, the deck tank taking the place of the upper portion of these boards, it will also be observed that the section is well adapted for liquid cargo, the free surface of same being gradually limited as the loading proceeds by the sloping sides of the ballast tank. By tapering the tank practically to a point at its lower extremity, as indicated, and having the hatch coamings closer than usual to the sides a self-trimmer is produced. Compared with other types, a greater percentage of the hold

and hatch space can be filled without any trimming, due mainly to the absence of the customary winch platforms between the several hatches necessary with other arrangements, the most favourable trimming charges being thus obtained; in fact, the necessity of any trimming whatever is practically dispensed with. In Fig. 2 is shown a portable saddle back shoot of light construction mounted on bogie wheels, enabling it to be travelled along the deck and placed in any desired position to aid the conveying of cargo equally into either side hatchway, when poured from the spouts. This arrangement will be advantageous in the case of very wide vessels; however, at most coaling ports, the facilities for loading are such as to enable the material to be poured directly into the offshore hatchway, or if need be, the usual temporary wood feeders could be employed. This novel construction should tend to produce a safer and drier vessel. due, in the first place, to the working deck being some 4 feet higher above the water line, while large volumes of water cannot find lodgment on board, as is liable to be the case with well-deckers. Secondly, if by some means one of the hold compartments happened to be opened to the sea, the central position of the deck tank makes it absolutely

steam or other power, and being mounted on the usual bogie wheels can travel the full extent of the central deck, upon which two separate lines of rails could be arranged, as illustrated, with junctions towards the ends of the vessel, allowing them to take up a position somewhat nearer to either side, as desired, the length of jib necessary, and, therefore, the cost of the cranes being considerably reduced in this way. The advantage of having, as it were, portable derricks, is readily seen when considering the loading or discharging of timber, pig iron, and other heavy articles which would require a minimum of handling in this type of vessel, due to the lifting gear being able to be placed directly over every part of the cargo space. Of course, discharging or loading with cranes from the shore is equally facilitated, as these are generally very powerful and possessed with a large radius of action, could work the cargo directly through either hatch. When at sea the cranes would be bolted and stayed as necessary and the jibs lowered.

Comparing the rates of discharging obtained by the proposed arrangement and that at present in general use, the vessel illustrated in Figs. 4 or 5, equipped with four grab cranes lifting 3 tons at 25 feet radius, and capable of working

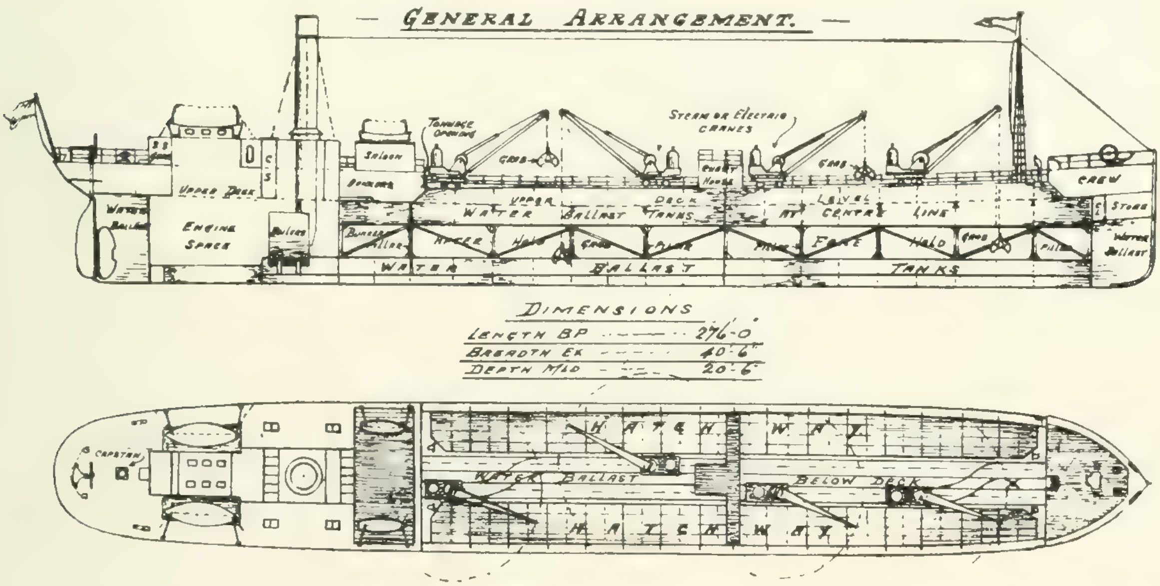


Fig 5

safe from damage in such a case, and it can be so constructed as to possess sufficient buoyancy, in conjunction with that of the cargo, to keep the vessel afloat, and what is equally important, to give sufficient area of intact waterplane to preserve the initial stability and keep her upright, whereas with side tanks, there is always the danger of one of these being damaged in case of collision, causing the vessel to heel over, due to the buoyancy of one tank only being available. The knowledge of the safety of such a ship would enhance its value as a freight earner, and also tend to favourable insurance rates both for owners and charterers.

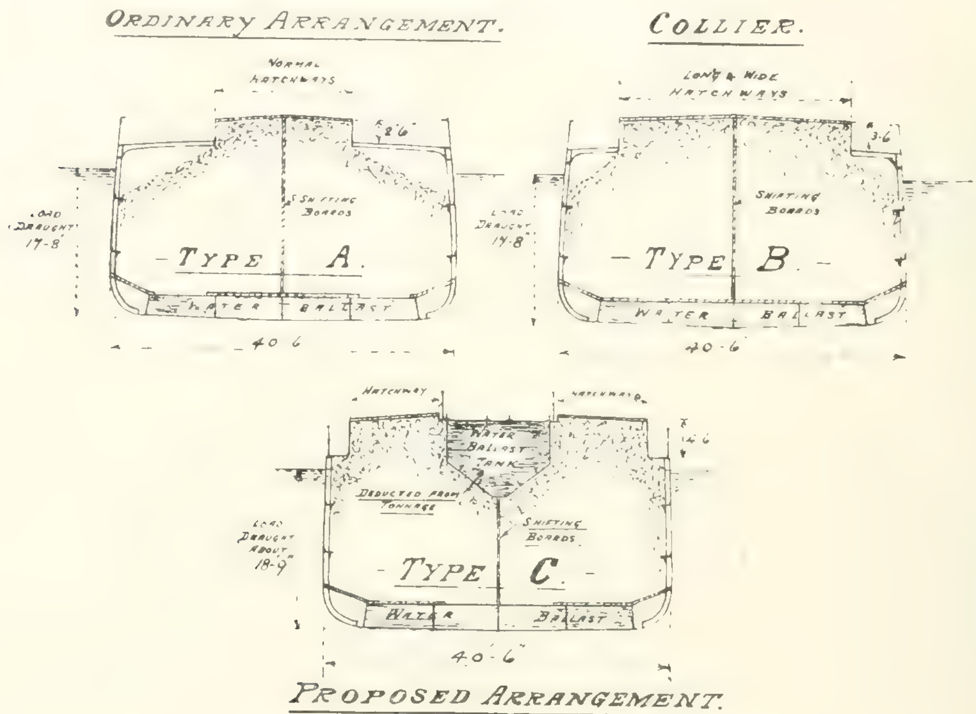
With regard to the proposed method of discharging it is thought that this type of vessel, as before stated, is well adapted for an equipment of cranes arranged to work grabs, having in view the reduction of labour and consequent saving of wages, besides the greatly reduced time taken to discharge. Full information has been gathered regarding price, weight, rate of discharge, coal consumption, etc., of light cranes designed specially for this kind of work, the particulars having been kindly supplied by the well-known firms of Messrs. J. H. Wilson & Co., Ltd., Birkenhead, and Messrs. Isles, Ltd., Leeds. The cranes may be driven by

grabs of one ton capacity, could discharge the freight of about 3,000 tons at the rate of 160 tons per hour, being 40 tons per hour, per grab (an average rate), requiring 19 working hours for completing the unloading, while the cost of the necessary labour would amount to the wages of four crane men—practically no trimming of the cargo to the grabs being necessary down below—and assuming these are paid 1/- per hour, the cost per ton (for labour) works out to less than ½d. Taking the same vessel with four ordinary hatches having the usual derrick and winch at each hatch and discharging with tubs or baskets filled by hand, at the fairly high rate of 15 tons per hour per derrick, would discharge the same quantity in 50 working hours, while the cost for labour, assuming nine men in all to each hatch at, say, 10d. per hour, comes out at 6d. per ton. The advantage of discharging with grabs shown by this brief comparison hardly needs further comment. The saving of time and expense enabling a regular trader to perform more trips in the year, should certainly appeal to shipowners, and it must be borne in mind that, taking into account the relative rates of discharging and cost of labour for same, the price of the cranes compare most favourably with the usual outfit, comprising

winches, derricks, steel masts, rigging, donkey boiler, copper steam pipes, etc. Increased economy and rapidity may be secured by more powerful cranes if the initial expenditure is of secondary consideration.

By the foregoing description it will be seen that the various advantages claimed to be secured by this novel construction cover practically all the most important points in the design of an economic vessel in the matter of obtaining the fullest benefit from the material used in the structure. A short study of the data set forth in the comparison of the three types should confirm this, attention being drawn more especially to the rates of deadweight to nett tonnage, and also that of cubic capacity to nett tonnage. In conclusion it may be stated that the patent covers several important modifications, adapting the system to much larger vessels than that described, and in the case of "Shelter Deck Vessels," for example, the central tank could be situated below the second deck, also two or more tiers of beams may be fitted if the vessel is of such a size as to require same.

It may be added that a favourable opinion has been expressed, with regard to the design, by several experts connected with the construction and working of steamers.



COMPARISON OF TYPES.

	ITEM	TYPE A	TYPE B.	TYPE C
1	% Total Weight of Steel (about)	100 %	102 %	103·5 %
2	Weight of Ship completed. "	1310 Tons	1350 Tons	1350 Tons
3	Deadweight capacity. "	3110 "	3070 "	3410 "
4	Nett Tonnage.	1030 "	1130 "	1020 "
5	Total Cubic Capacity including Bunkers & Tanks (Topside).	154850 c.f.	162550 c.f.	176050 c.f.
6	Cubic Capacity, excluding Permanent Bunkers.	148400 "	156100 "	169600 "
7	Capacity available for Untrimmed Cargo.	112900 "	138800 "	141000 "
8	Total Water Ballast Capacity.	765 Tons	765 Tons	1295 Tons.
9	Mean Draught with Ballast & Bunkers	9'-10"	10'-2"	12'-0"
10	Metacentric Height (GM) with Ballast & Bunkers	8'-0"	7'-9"	4'-3"
11	Deadweight ÷ Nett Tonnage.	3·02 Tons	2·72 Tons	3·34 Tons
12	Total Cubic Capacity (5) ÷ Nett Tonnage	150 c.f.	144 c.f.	173 c.f.
13	Capacity for Untrimmed Cargo (7) ÷ Nett Tonnage	110 "	123 "	138 "
14	Total Cubic Capacity (5) ÷ Deadweight	50 "	53 "	51·5 "
15	Capacity for Untrimmed Cargo (7) ÷ Deadweight	36 "	45 "	41·5 "
16	Deadweight ÷ Steel Weight (1) %	100 %	96·5 %	106 %
17	Total Cubic Capacity (5) ÷ Weight of Steel (1) %	100 %	103 %	110 %

Fig. 6.

THE FLEETS OF THE MAIL LINES.

(From our Own Correspondent.)

Disasters.

THE most important loss during the month has been that of the steamship *Mahratta* of the Liverpool Brocklebank line, which went ashore on the Goodwins on the evening of Good Friday, when homeward bound to London and Dundee from Calcutta with a valuable cargo comprising in its 10,000 tons such costly commodities as rubber and tea, rice and jute. At first the grounding was evidently thought a slight matter, for the proffered assistance of a homeward bound Harrison liner was declined. But in spite of the efforts of a number of tugs, after some twenty-four hours on those treacherous sands, the vessel parted at the saloon. This catastrophe can hardly have been altogether unexpected if the descriptions of the noises caused by the strain on the fabric of the ship are not very greatly exaggerated. Salvage of cargo is going on. But the fore end of the wreck is already sinking into the sand, and those who know the spot are of opinion that eventually—and that in no long time—the whole vessel will be engulfed. This is said to have been the first loss sustained by the Brocklebank line since their entry into steam some twenty years ago, and this casualty seems a somewhat unaccountable one. For the *Mahratta* was in charge of a pilot, and there does not seem to have been any exceptional reason why the ship should have failed to keep the what one might almost call "beaten" path up the channel. Fortunately all those on board the steamer were saved, though the wreck was rendered the more tragic by the fact that after the stranding the chief engineer was found dead in his bunk. The causes which led to his death, however, seem to have been quite independent of anything connected with the accident.

Sir Donald Currie.

A heavy, though not perhaps altogether unexpected, loss, considering his advanced age, has been sustained by the mercantile marine in the death of Sir Donald Currie at Sidmouth. For particulars of his great career the reader is referred to the obituary notice in another part of the journal.

Legal Decisions.

There have been one or two important decisions under the Workmen's Compensation Acts—some of them arising out of the peculiar relationship between the shipowner and his employés afloat. I say peculiar, because in most shore businesses the master is only responsible in damages for what happens to his men during their working hours or at most when they are on their way to or from their work. But the seamen when at sea, is on the shipowner's premises all through the voyage or engagement, and in a sense therefore he is at the shipowner's risk all through the twenty-four hours. But in the case of the owners of the *Wild Rose* against Marshall a certain limit was shown to exist in regard to this principle. The respondent was the personal representative of one Marshall, who was second engineer of the steamer *Wild Rose* at the time of his death in May last. The ship was then lying in the harbour of Aberdeen. At ten o'clock at night Marshall, in company with the chief engineer, came aboard the ship and they then proceeded to get up steam. The night being hot Marshall came on deck to get air. At midnight he was missing and his body was subsequently found close to where the ship had been lying. Compensation was claimed for the loss of his life and the County Court judge, who first heard the case, found in favour of the claimants on the ground that he met with his death from an accident "arising out of and in the course of his employment." But the employer appealed and the Court of Appeal then reversed the decision of the lower court. The argument for the representatives of the deceased was that the man came on deck, not merely for the purpose of getting air, but further for the purpose of the better fitting himself for the work upon which he was engaged. The Master of the Rolls, however, failed, as did the other Lords Justices, to see that there was any proof of that fact. They further showed that, though the man may have been lost from an accident in the course of his employment, it lay upon the claimants to show that the accident was one which arose *out of* that employment. No attempt was—or under the circumstances could be—made to prove that, and in the absence of proof the claim failed. The lesson to be drawn from the matter surely is that it is unwise for those who go to sea to rely on the chance that their relatives will, under the new law, get compensation if anything happens to the breadwinner. There are still so many technicalities and refinements in the law that the inclusion of seamen in the classes by whom compensation may be recovered, though no doubt often of great benefit to those concerned, is still so hedged about with qualifications and difficulties that there can be no reliance on getting compensation in every case where loss of life occurs, and for that reason the wise man will still continue to take advantage of the old forms of insurance and thrift.

Another case which may have an important bearing on the same subject of compensation was that brought by the owners of the *Julia* against those of the *Annie*. The two vessels were sailing barges on the Mersey, and, getting into collision, the master of one of them was knocked overboard and unfortunately lost. The owners of his vessel in due course were found liable to compensate his surviving relatives. They then brought their action against the owners of the other vessel and succeeded in showing that they were to blame for the contact. The damage sustained by the colliding vessels was of the slightest, and, apart from the loss of life there would probably have been no claim at all. But under the circumstances, the fact of the collision had cost the owners of the innocent vessel some three hundred pounds paid as compensation to the relatives of the deceased master. Mr. Justice Bargrave Deane held that this sum was one which might properly be claimed against and recovered from the owners of the offending ship, and he accordingly gave judgment for that amount.

The Callao Floating Dock

has at last accomplished its long and tedious voyage in safety. She is capable of lifting vessels of 7000 tons displacement and of 22 ft. draught, whilst the extreme beam of docked vessels may be 70 ft. Arrangements have been made whereby, if need be, the dock can subsequently be lengthened so as to increase the lifting power to 9000 tons. But even as she was the work of taking her from Messrs. Swan, Hunter and Wigham Richardson's yard on the Tyne, where she was constructed, to her port of destination was a sufficiently arduous one. The voyage was commenced as long ago as the 20th August, the tugs employed being the Dutch vessels *Roodesee* and *Zwaartesee*. Three days after starting the flotilla encountered a heavy gale and had to take refuge in Dungeness Bay. But after a sojourn of two days the dock's cables parted and she had to be towed into the Thames, where the weather, still continuing very severe, the dock eventually got ashore at Gravesend. She was then beached at Tilbury. The voyage was resumed on the 18th September and the craft reached St. Vincent on the 11th October. A long stay had, however, to be made at the next halting place, Monte Video, where they arrived on the 18th November. This was owing to the breakdown of the *Roodesee*, which met with such damage as to necessitate her replacement by the same owners' *Oceaan*, which was sent out from Holland for the purpose. The dock reached Callao in safety on the 4th April, having been about four months at sea—if allowance be made for the time sent in port owing to the mishaps which I have mentioned. The speed averaged during the early part of the towage was about 4½ knots.

The London County Council

has at last begun the disposal of its unfortunate fleet of river steamers. Two of them, the *Francis Drake* and the *Thomas More*, have been sold to Belgians, whilst a third, the *Gibbon*, has also gone across the Channel. A thousand pounds seems to be about the price which these vessels will fetch in the market. It seems a small figure considering that they cost from five to six times that amount only four years ago, and especially as we may assume that the first to go will probably be found to be the pick of the bunch.

The Reports of various Atlantic Steamship Companies

have recently been published. The experience of the Hamburg-American Company—which after so many prosperous

years is now forced to pass its dividend altogether—has perhaps prepared one for bad times. But the story told by the management of some of the companies is not altogether cheerful reading. The Nord Deutscher Lloyd, for example, has to confess that the gross profit which in 1907 was over £1,600,000, has fallen in 1908 to £460,000. General charges are, nevertheless, considerably higher, being £400,000 in 1908 as against £290,000 in 1907. The result is that not only is no dividend declared but the amount transferred to depreciation is cut down from £800,000 to £700,000, in spite of the fact that the fleet is increased in size and value, and yet it has been necessary to wipe out the entire reserve and renewal funds! Then the Leyland Line—so prosperous before it was taken into Mr. Morgan's Combine—has a similarly gloomy story to tell. The gross profit was just under £90,000 for the year's working. But general expenses and the provision of what was due for debenture interest and such matters reduced the £90,000 to £21,000. Thus when a sum of £115,000 had been written off for depreciation there was a nett loss on the year's working of £94,000. As there is already a considerable balance on the wrong side of the account in this company the total figure now standing to the debit of profit and loss is £219,000.

In the face of these disastrous figures the Cunard Company's report is quite a favourable one. True, they pass the dividend and take £100,000 from the insurance fund as well as £50,000 from the reserve. But I remember one company that for years made its books balance by what it was able to take from its insurance fund—the safe navigation of the ships thus in a double sense contributing to the prosperity and continued existence of the company. Cunard's however, have carried no less than £297,000 to their depreciation account, and have paid off the substantial amount of £130,000 from their indebtedness to the Government on account of the sums advanced to them to aid them in the construction of the two great liners *Lusitania* and *Mauretania*. We now have the first year's accounts in which these vessels working has been continuous, and the results are consequently of deep interest. The gross revenue for the year—in spite of the depression which has caused such a *debacle* in the finances of the foreign companies and in spite of the immense falling off in steerage traffic—is the greatest recorded in the history of the premier Atlantic Company, though it only exceeds the total of 1907 by about £5000. The working expenses, however, have increased by £370,000, whilst it has been considered necessary to add £42,000 more than last year to depreciation. Interest charges, too, which were *nil* in 1904, and only £52,000 in 1907, have increased to £133,000. It would seem, therefore, that the new steamers, though evidently and necessarily very costly to work, are valuable additions to the earning power of the fleet, and it would further seem that though the shareholders have (as might be anticipated under the circumstances) had to forego their dividend the close of 1908 finds the company in a stronger position than it was at the commencement of the year. I say stronger, and I mean stronger in every sense. Stronger absolutely, because everything possible has been fully debited to the year, and stronger relatively to its competitors because whilst it has made full allowance for depreciation, some of them have felt it desirable to lessen the amount set aside for this necessary purpose.

The Egyptian Mail Steamship Company.

This company being, as we have seen already, in liquidation and its steamers being laid up, the fleet of two first-class passenger steamers has been on offer for sale by private treaty for some time. Buyers, however, seem reluctant to come forward and so, to encourage them and to give them an opportunity of securing a bargain, it is announced that on the 11th May the two 12,000 ton turbine engined passenger liners will be offered at auction by Messrs. Kellock's, of Liverpool. With all the prophets declaring that the passenger season of 1909 will make up for all the deficiencies of 1908, and restore prosperity to Atlantic companies it may be worth someone's while to secure these vessels to reap a share of the coming harvest. But we shall see.

The Development of the Motor Boat

industry is evidenced by the fact that the Board of Trade has felt it now desirable to issue regulations to its surveyors as to the requirements upon which they are to insist before recommending such vessels for passenger certificates. The vessels must be specially examined so that the surveyor may satisfy himself that due precautions have been taken to provide against the occurrence of fire or explosion, and that proper means of combatting an outbreak, should one occur, are provided.

The "Netherton Hall,"

which suffered from a disastrous fire in the Straits of Sunda a couple of years ago, and which was considered a total loss, has suddenly returned to activity after being struck off the register. She has been purchased as she lay in her damaged condition at Singapore by a Hartlepool firm, who, after temporary repairs on the spot carried out under the direction of one of their partners, are now bringing her home under her own steam with a view to refitting and completely repairing her. Some of my readers may remember photographs of her damage which showed how her sides had fallen inwards and how much a wreck she seemed, and will, therefore, marvel at the enterprise which has thought it worth while to undertake so heavy and apparently so unpromising a job.

Additions to Atlantic Fleets.

The season of 1909 will see several important new competitors in the Atlantic struggle. Already the *Cleveland*, first of two new sisters built for the American service of the Hamburg line, has started on her maiden trip across the Atlantic. The Nord Deutscher Lloyd expects two large vessels to be added to its list during the year in the *Berlin*, specially built for the New York and Mediterranean trade, and the *George Washington* for the Bremen and Southampton trade to New York. Various components of Mr. Morgan's Combine are adding to their strength. The Red Star Line has just got delivery of their 17,000 ton twin-screw liner *Lapland*—the biggest ship that has ever passed up the Schelde. The Atlantic Transport Company is to despatch their new vessel, the *Minnewaska*, from London to New York on the first of May. Though of little more than 14,000 tons gross register, that is to say, of less than half the size of the *Mauretania* or *Lusitania*, she will be the biggest vessel hailing from the Thames. The White Star Company has its 15,000 tons *Laurentic*, with her triple screw arrangement driven by reciprocating and turbine engines in combination—a vessel which is not only to effect great economy in coal consumption, but which is also to make the Dominion service to the St. Lawrence a formidable competitor with the favourite Allan and Empress liners. So if, indeed, the Atlantic traffic be heavy this year, there will be plenty of additional mouths to be filled!

Iron and Steel Institute.—We are informed that the annual meeting of the Institute will be held at the Institution of Civil Engineers, Great George Street, Westminster, on Thursday and Friday, the 13th and 14th of May, commencing each day at 10-30 o'clock, a.m. If, through the pressure of his engagements, Sir W. Thomas Lewis is not able to be present, Sir Hugh Bell will occupy the chair. Some very good papers are expected to be submitted. On the first day the report and statement of accounts, 1908, will be presented; election of officers and council will take place; a resolution will be submitted proposing the adoption of the Revised Bye-laws, recommended by the council and presented at the autumn meeting, 1908; and a selection of papers will be read. On the second day the Bessemer gold medal for 1909 will be presented to Mr. A. Pourcel (Paris); the awards of the Andrew Carnegie medals and the Research Scholarships for 1909 will be announced; and further papers read. In the evening, the annual dinner of the Institute will be held in the Grand Hall of the Hotel Cecil, and many noblemen and gentlemen have already accepted the invitation to be present, amongst whom are His Grace the Duke of Devonshire, the Lord Aberdare, the Lord Glantawe of Swansea, Lord Edmund Talbot, M.P., Admiral Sir Cyprian Bridge, G.C.B., Sir Wm. H. White, K.C.B., Sir David Brynmor Jones, K.C., Colonel J. R. Wright, the Lord Mayor of Cardiff, Mr. Charles Trevelyan, M.P.

The T.S.S. *Lapland*. Vestibule—Main Entrance.

The T.S.S. *Lapland*. The Lounge.

The T.S.S. *Lapland.* The Reading Room

The T.S.S. *Lapland.* The Smoke Room

a bandstand has been provided overhead immediately forward of the "well" balustrading. An electric elevator has been provided, adjoining the saloon, to convey the passengers to and from this room.

The first-class lounge, also the reading-room and the first-class smoke-room, are splendidly situated on the promenade deck.

The lounge, situated forward on the upper promenade deck, is a spacious apartment, panelled in oak, designed in the dignified style of early Georgian times, handsomely relieved with carvings. At the after end is an inglenook, with a well-proportioned and noble-looking fireplace and overmantel, and the views of well-known Belgian and American towns which are depicted in the excellent paintings on the windows will prove interesting to the passenger.

The reading-room is another sumptuous and elegant apartment, situated amidships on the upper promenade deck, the decoration partaking of the pale and trim elegance of the style known as Adam Brothers. A prominent feature in this room, as in the lounge, is an inglenook. The first-class smoke-room is also of great height, being 11 ft. 3 in. from beam to beam. The chief feature in this room is the handsome decorated dome over the centre, giving the twelve signs of the Zodiac.

On the promenade deck aft there is a very cosy verandah with small tables arranged in the café style. This is sure to prove a favourite spot with passengers.

The second-class passenger accommodation on the *Lapland* is very superior. The saloon, situated on the middle deck, will seat 220.

The second-class smoke- room is on the promenade deck aft, panelled and framed in oak, and the second-class library, another fine room, is on the bridge deck aft. The second-class state rooms are on the shelter deck aft, and upper deck port side amidships. The third-class accommodation on this vessel is also very suitable. The other arrangements throughout the ship for the comfort of passengers and for ensuring satisfactory service of meals, etc., have been carefully thought out, the galleys and pantries being of large capacity and conveniently arranged to their respective saloons. The refrigerated chambers and store rooms—a very important provision on board passenger steamers—are very conveniently arranged for the easy handling of ship's stores, etc. The ventilation has had the special attention of both the owners and builders, an exceptionally large and effective system being introduced throughout, ensuring a sufficiency of both mechanical and natural ventilation. The spaces allotted for passengers' promenades are exceptionally fine, including on the promenade deck, both on the port and starboard sides, a covered promenade with large vertical sliding windows fitted in the wind screen at ship's side, giving all the advantages of a deck promenade without discomfort in boisterous weather and an uninterrupted view of the ocean. The *Lapland* is provided with a submarine signalling apparatus and wireless telegraphy. The vessel has twin screws, the machinery being of the quadruple expansion "balanced" type.

THE ASSOCIATION OF ENGINEERS IN CHARGE.—The fourteenth annual dinner of the Association of Engineers in Charge was held at the King's Hall, Holborn Restaurant, on Saturday 27th March, 1909, when the chair was taken by the president of the association, James Swinburne, Esq., F.R.S., M. Inst. C.E., etc., and the vice-chair by Mr. Arthur Davey. The members and guests numbered over 300, among which were many distinguished gentlemen representing government departments, the scientific profession, the shipping interest and commerce generally. The toast of "The Association" was proposed by Sir W. H. White, K.C.B., LL.D., F.R.S., and responded to by Captain H. Riall Sankey, R.E. (Ret.) M.Inst.C.E.; that of "The President" was given by Mr. Arthur Davey, to which the president responded; that of "Our Guests and Friends" was proposed by Dr. R. T. Glazebrook, F.R.S., and responded to by A. J. Walter, Esq., K.C.; while the toast of "The Kindred Institutions" was proposed by Mr. A. E. Penn, and responded to by H. Percy Boulnois, Esq., M.Inst.C.E. The toasts were interspersed with musical items of an interesting and amusing programme, and the whole function passed off with the greatest éclat, on which the association and its officers are to be heartily congratulated.

IMPERIAL INTERNATIONAL. EXHIBITION.

THE Imperial International Exhibition to be held at the Great White City at Shepherd's Bush this year will be opened about the end of May by the Duke of Argyll. The grounds, which last year comprised 140 acres, are to be increased this year to 150 acres, and a number of buildings have been added, in which many interesting exhibits will be housed. A strong and representative engineering section has been arranged and the following committees have been set up: A General Mechanical Engineering Committee, a Building and Engineering Construction Committee, a Mining Committee, and a Metallurgy Committee, with sub-committees specially to deal with smoke abatement appliances, gas, oil and steam power and accessories, contractors' plant and appliances, machines, pneumatic and other tools, pumping machinery and accessories, printing machinery and accessories, refrigerating machinery and accessories, marine engineering and shipping, general building and sanitation, re-enforced concrete and fire resisting systems, steel work construction and civil engineering. The Secretary to the committees is Mr. W. Yorath Lewis, M.Am.S.Mech.E., A.M.I.M.E., A.M.I.E.E., Manager of Engineering Sections, Administration Offices, Macfarlane-road, Shepherd's Bush, W.

REFRIGERATING INDUSTRIES.—Some of the results of the International Congress of the Refrigerating Industries, held at Paris last October, promise to remain as constant factors which will be of permanent effect in assisting all those who are concerned in refrigeration. An International Association has been formed, affiliated to some extent with National Societies having similar objects in view, these objects being the organising of means for spreading information on the subject of refrigeration and its capabilities, the standardisation of terms and dimensions, methods of testing material and placing facilities in the way of members for obtaining data on any subject connected with refrigeration and the carriage of frozen produce. The headquarters of the association at Paris is 10, Rue Denis-Poisson. The British section has as Vice-President Sir E. Montague Nelson, and four Members of Council, Messrs. W. D. A. Bost (Paisley), H. C. Cameron (New Zealand), the Hon. T. A. Coghlan (Australia), Hal. Williams (London), with Mr. R. M. Leonard as Hon. Secretary, from whom particulars as to membership may be obtained. With a view to elicit expressions of opinion on the subject of a standard method of testing insulating materials, Mr. Bost read a paper at a meeting of the Cold Storage and Ice Association, on April 5th. The author is a member of the committee appointed by the International Association to make tests of details connected with the refrigerating industry, and the selection of the most suitable apparatus or method of testing insulation forms one of the important functions of the committee. In the paper in question Mr. Bost described the various kinds of apparatus which have been used for conducting tests of material, pointing out the weak points of each and suggesting a combination of the best methods in order to reach a standard method which might be acceptable to all concerned. He also considered that an apparatus on the principle of the Thermos Flask would probably serve the purpose and give more accurate results. A great deal of work in the direction of research was manifestly involved in the preparation of the paper, the large number of authorities and articles referred to or quoted from indicated this, and gave the assurance that, as a member of the committee, the intention of the writer was to keep fully alive to the duties he had undertaken. It is an augury of the good which may be accomplished by the various International Committees.

STORM-PROOF FLARE LIGHTS.

In these days of low freights, every effort must be made by shipowners to increase the earning capacity of their ships, by reducing as far as possible the time occupied in loading and discharging cargo.

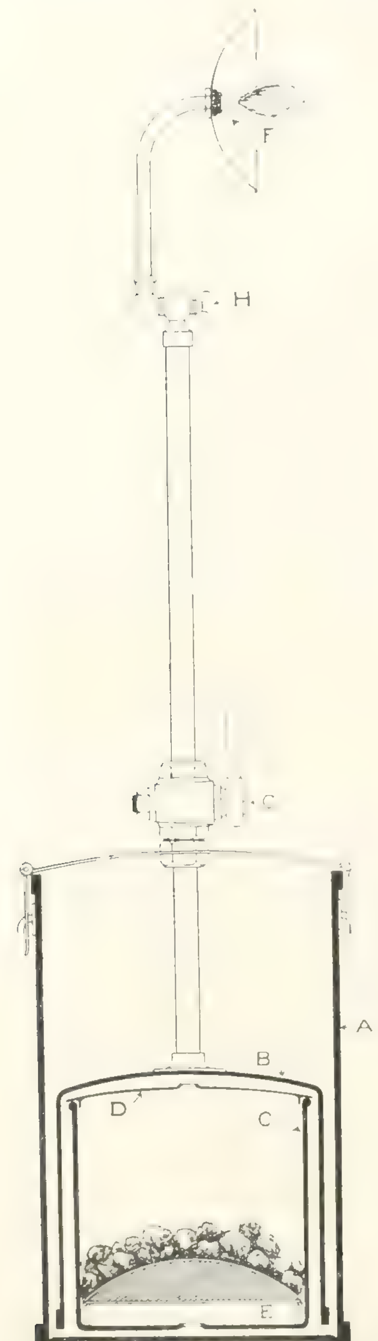


Fig. 1

Any device which enables these operations to be carried on with safety and expedition during night-time must of necessity be a great assistance towards the end in view. It may be said that any illuminating device must be essentially storm-proof, must give a steady light and be devoid of any tendency to emit sparks, easy to manage, and substantial in character to withstand the rough usage likely to occur on board ship.

We have much pleasure in illustrating and describing the arrangement for producing an acetylene flare light which is being put on the market by The Imperial Automatic Light Co., Ltd., of 123, Victoria Street, Westminster, whose works are situated at Bowling Green Street, Kennington, London, S.E.

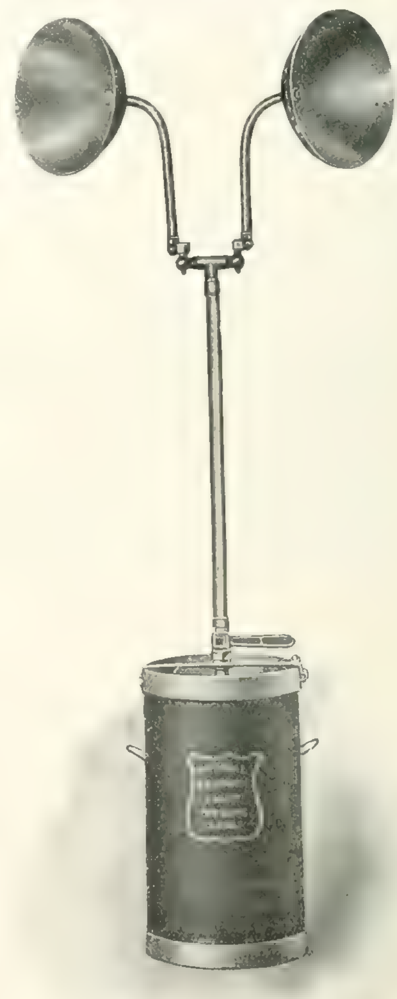


Fig. 2

In Fig. 1, which is a part sectional view of the apparatus, will be seen that the device consists of only eleven parts, of which the following are the principal:

Within a water tank *a* of substantial construction is installed a gas bell *b* attached to a pipe carried by the cover of the tank.

This gas bell *b* is disposed over a carbide chamber *c*, having a detachable lid *d*, and a grid *e* upon which latter the carbide is placed. The pipe from the bell *b* is fitted with a main cock *f*, and at its upper end is a swivel joint *h*, which latter carries patent gas burners *f*, having a reflector attached thereto.

In order to put the light into operation, the grid in the carbide chamber is covered with the proper charge of carbide, and the bell is placed in position over the carbide chamber.

The tank *a* is then filled with water, and when the main cock is turned full on, the burner can be lighted.

Dealing with the question of safety, it will be recognised that this apparatus is absolutely safe under practically any conditions, even in inexperienced hands, and it is impossible for the internal pressure of gas to be greater than that of which the apparatus is designed.

The average gas pressure is less than half a pound per square inch, and, the apparatus being open at the top, no safety valves, regulators, or pressure gauges are required; its action during use being entirely automatic. Should the apparatus be upset, the light is immediately extinguished, and for winter work no risk of freezing exists, even in the coldest weather. The flame being short in length and steady in character, insures it being storm-proof, while it throws off little heat and no smoke, and has a great range of well-diffused light. The light may be conveyed to any position by hose or metal pipe, and its direction may be altered by means of the swivel joints. A good illustration of its general use is shown in Fig. 2, which represents two flare lights, one on the foremast and the other of the jib of the crane, and it will be noticed that in the latter case the light follows the cargo. The most suitable apparatus for ship working is illustrated in Fig. 3, which represents a double burner portable apparatus; each jet emits 1150 candle power, and the apparatus has a capacity of 12 hours continuous lighting. When emptied the whole device weighs about 97 lbs., and when fully charged about 186 lbs.

The approximate cost of working per hour is 2⅛d. per jet. In comparing the cost of Imperial flare lights with ordinary oil flares, the result is 20 per cent. in favour of the Imperial lights, and the saving in working is shown by the running cost being at least 25 per cent. less than any other light on the market.

Fig. 3.

An important consideration is the absence of expensive burners or parts, also the fact that attendance is not necessary when the lights are once started; the light being particularly suitable for use in confined situations, as the temperature is not perceptibly raised, as far less oxygen is taken from the atmosphere by acetylene than by any other illuminant known, except of course incandescent electric lamps.

THE INSTITUTION OF NAVAL ARCHITECTS.

THE spring meeting of the 50th session of the Institution of Naval Architects was opened on March 31st, in the Hall of the Royal Society of Arts. In the absence of Lord Cawdor, the president of the institution, the usual presidential address was omitted. Sir William White, who occupied the chair, announced that a vote of sympathy had been transmitted from the institution to Lord Cawdor in connection with his recent bereavement. There was a large attendance of members, amongst whom we noticed Lord Pirrie, Lord Brassey, the Hon. T. A. Brassey, Lord Inverclyde, Lord Graham, Hon. C. A. Parsons, Engineer Vice-Admiral Sir John Durston, Sir Philip Watts, Sir J. I. Thornycroft, Sir W. Theodore Doxford, Engineer Vice-Admiral H. J. Oram, Sir Alexander Kennedy, Sir James Williamson, Admiral C. C. P. FitzGerald, Sir G. Holmes, Admiral Henderson, Admiral the Hon. Sir E. R. Fremantle, Admiral Sir Digby Morant, Admiral Sir Bowden-Smith, Admiral Douglas, Professor Biles, Messrs. A. F. Yarrow, R. E. Froude, H. J. Cornish, A. Denny, D. J. Dunlop, W. J. Luke, C. E. Stromeyer, Andrew Laing, C. E. Ellis, John Inglis, James Dunn, and W. E. Smith. The proceedings were opened by the chairman calling upon the secretary to read the annual report.

Annual Report of the Council.

The annual report of the council for the past year stated that the total membership of the institution has continued to increase, as, notwithstanding a decrease in the number of associates, the total membership of all classes amounted to 1,842, as against 1,796 in 1907 and 1,758 in 1906. The total number elected in 1908 was 120, against which must be set a loss of 74, through death, resignation, and other causes, leaving a net gain of 46. The institution has sustained a great loss through the lamented death of the hon. treasurer, Dr. Francis Elgar, F.R.S., whose devoted services on the council, over a long period of years, cannot well be over estimated. The vacancy thus created in the office of treasurer has been filled by the election of Mr. James Dixon, chairman of Lloyd's Register Society. Under Dr. Elgar's will the institution receives an immediate legacy of £1,600 for the endowment of a scholarship in naval architecture, and is also to benefit by the reversion of a portion of the testator's estate. The council, acting on behalf of the institution, has gratefully accepted these generous gifts, and has resolved that the scholarship should be known as the "Elgar Scholarship in Naval Architecture." The council have elected Sir John Thornycroft an honorary vice-president of the institution, and has re-elected Mr. J. Bruce Ismay to represent the institution on the Court of Liverpool University for a further term of three years. Owing to the death of Dr. Elgar the following selection of representatives has been made: Sir Theodore Doxford, on the Advisory Committee to the Board of Trade; Sir John Thurston, on the governing body of the Imperial College of Science and Technology; and Mr. Thomas Bell, of Clydebank, on the Main Engineering Standards Committee. It is not proposed to hold a summer meeting this year, as the completion in 1910 of fifty years since the foundation of the institution in 1860, will call for a special commemoration of that event, and it is intended that an international congress shall be held in London next year, to which delegates from the principal foreign countries will be invited. Progress has been made during the past year with the scheme for establishing an experimental tank in connection with the National Physical Laboratory at Bushey, as the result of Mr. A. F. Yarrow's generous offer to defray the cost of construction. The amount which it is desired to have guaranteed for the maintenance of the tank during the first ten years of its existence has not yet been fully subscribed, but the governing body of the National Physical Laboratory have expressed their readiness to proceed with the execution of the scheme without further delay, and it is anticipated that all the necessary support will be forthcoming from the shipbuilding and shipowning firms. The Martell scholarship in naval architecture was awarded this year to a candidate who subsequently failed to comply with the conditions laid down for holders of the scholarship, and the Council accordingly awarded the scholarship to the next candidate in order of merit. This candidate also failed to comply with the conditions laid down, and the council, after considering the claims of other candidates, resolved to let the scholarship remain in abeyance for a year. A movement was set on foot in Scotland last summer to erect a memorial to the late Marquis of Linlithgow, and, a sum of about £2,000 having been collected, it is proposed to erect a statue to his lordship in Edinburgh. Members of the institution were invited to contribute to this fund, and their subscriptions, amounting to £153 5s. 6d., have been gratefully acknowledged. The award of the annual gold medal has been made to Captain T. J. Tresidder, C.M.G., for his paper on "Modern Armour Plate and its Attack," while a premium has been awarded to Mr. W. S. Abell for his "Notes on Ship Calculations." The President having moved the adoption of the report, which was carried *nem. con.*, the list of names of proposed new members, associate members, associates and students was read.

The following gentlemen were elected members of the council:—Vice-president, Hon. C. A. Parsons; members of council, Sir Benjamin Browne, Engineer Commander G. G. Goodwin, Messrs. James Bain, R. R. Bevis, James Denny, W. H. Dugdale, J. B. Marshall, James McKechnie, J. R. Perrett, W. J. Pratten, C. E. Stromeyer, S. J. P. Thearle, Professor J. J. Welch; associate members of council, Professor Ewing, Rear-Admiral Sir H. B. Jackson, and Professor Vivian B. Lewes. The gold medal and premium, as previously mentioned in the council's report, were presented, and the recipients having returned thanks, the Right Hon. Lord Brassey was called upon to read his paper on "Types of Warships omitted in recent programme of naval construction," and which we refer to elsewhere in our columns. Discussion was opened by Admiral FitzGerald, who disagreed with the author on most of the issues raised, and said that there were many naval men who did not approve of the *Dreadnoughts'* design or armament, and that it was quite possible if her plans had been discussed they would have been different. With regard to the small ships mentioned in the paper he had never been able to discover what moderate dimensions were, and he did not believe they existed. Admiral the Hon. Sir E. R. Fremantle and Professor Biles, Sir Wm. White, and others, also took part in the discussion.

Other papers read on March 31st were "Standardization," by Mr. Archibald Denny, and "The vibrations of ships and the use of a dynamical model for determining the elasticity of ships," by Prof. J. B. Henderson; the latter paper we give in full in the current issue, and Mr. Denny's paper will be given in our next issue.

The Annual Dinner.

At the annual dinner on the evening of the same day, held at the Hotel Cecil, Sir William White presided, and a large and representative company included the following:—Admiral Sir J. R. Jellicoe, Mr. T. Kato (Japanese Ambassador) Commander Baron Mercier de Lostende French Naval Attaché), Sir A. Geikie (president of the Royal Society), Lord Pirrie, Dr. Henry T. Bovey, Dr. T. J. Macnamara, M.P., Captain Widenmann (German Naval Attaché), the Marquis of Graham, Sir Philip Watts, Captain Tochinai (Japanese Naval Attaché), Commander J. H. Gibbons (United States Naval Attaché), Admiral C. C. P. FitzGerald, Near-Admiral F. T. Bowles (President of the American Institution of Naval Architects), Sir Melville Beachcroft, Admiral the Hon. Sir E. Fremantle, Mr. Owen Philipps, M.P., Sir John Thornycroft, Mr. J. A. F. Aspinall, Sir Charles M'Laren, Captain Behr (Russian Naval Attaché). Mr. James Dunn, Admiral Sir R. Custance, Mr. James Denny, Professor J. H. Biles, Mr. John Inglis, the Hon. C. A. Parsons, Dr. R. T. Glazebrook, Sir Walter J. Howell, Mr. John Ward, Mr. Summers Hunter, Mr. J. T. Milton, Mr. Francis Henderson, Sir James Williamson, Mr. R. Steele, Mr. R. Saxton White, Mr. J. Hallett, Mr. R. Balfour, Mr. J. Gravell, Mr. A. Gracie, Mr. James Hamilton, Mr. H. R. Champness, Mr. H. J. Cornish, Mr. S. J. P. Thearle, Mr. C. E. Stromeyer, Mr. J. Foster King, Mr. D. J. Dunlop, Mr. Henry Withy, Sir George Holmes, Mr. A. E. Seaton, Mr. E. T. Agius, Mr. J. E. Thornycroft, Mr. James Gilchrist, Mr. A. Mather, and Mr. R. W. Dana, secretary.

The session was continued on 1st April. Sir Wm. White again occupied the chair and nearly all the prominent men who were at the opening proceedings were in attendance.

Two papers first on the agenda, "Some considerations on the application of internal combustion engines for marine propulsion," by Mr. H. C. Austey, and "Internal combustion engines for submarines," by Mr. F. R. S. Bircham, are referred to in our editorial notes. Lieut.-Colonel G. Rota's paper on "The propulsion of ships by means of contrary turning screws on a common axis," and Mr. J. H. Heck's paper in the form of a "Note on a mechanical method for determining the thrust of propellers," form the subject of editorial comment. Mr. A. G. Lyster and Mr. W. Boyd were joint contributors of the first paper presented in the evening. Mr. Lyster described the dredging that has been done in the bar channels of the Mersey and later Mr. Boyd described the suction dredger, a description of which we give in the current issue. Other valuable papers were read during the session as follows:

"The turbine passenger steamer *Ben-my-Chree*, and practical experience of the Parsons marine steam turbine," by C. J. Blackburn, Esq.

"Explosions of steam pipes due to water hammer," by C. E. Stromeyer, Esq.

"On the resistance of thin plates and models in a current of water," by T. E. Stanton, Esq., D.Sc.

"The accelerated motion of bodies in water with special application to the rolling of ships," by A. W. Johns, Esq., R.C.N.C.

"On launching calculations, with special reference to the effect of camber," by John Smith, Esq., R.C.N.C.

"A note on ship geometry," by Sir George Greenhill, F.R.S.

"Some points in connection with shipbuilding on the Great Lakes, U.S.A.," by Prof. H. C. Sadler, D.Sc.

"The influence of form and bulkheads on the strength of ships," by J. Bruhn, Esq., D.Sc.

"Diverging waves," by Prof. Wm. Havgaard.

"The report of the Experimental Tank Committee (1908), and the speed trials of the destroyer *Cossack*," by Sir Philip Watts, K.C.B., etc., we shall publish in full in an early issue.

Want of space alone prevents us from reporting all the papers read and the discussions that they gave rise to. The proceedings terminated on April 2nd, with the usual vote of thanks to the Council of the Society of Arts for the use of their hall, and to Sir Wm. White for his presidency. Sir George Holmes proposed the vote of thanks to the Council of the Institution and paid a tribute of much feeling to the memory of Dr. Elgar.

TRAWLERS FOR THE NAVY.

IT is definitely known at Grimsby that in all five modern British steam trawlers have been bought recently by the Admiralty, for use as adjuncts to the navy.

One of these vessels, the *Arizona*, is at present at Grimsby awaiting final instructions to proceed to Plymouth or Portsmouth. She is painted the regulation colour, and was one of the vessels on which a Government agent recently had a series of trials on the Humber. A second vessel, the *Nunthorpe Hall*, has been purchased from North Shields. Originally this trawler was built for West Coast owners, by the Smith Dock Company, of South Shields. The other two trawlers have been bought by an Admiralty emissary at Fleetwood that are named the *Osprey* and *Josephine*. They have been delivered over to the naval authorities at Sheerness, and the *Josephine* has been placed in charge of the staff of the torpedo school ship *Actaeon*, to which vessel she will be attached as tender for the present. The latest purchase is the *Assyrian*, a newly-built vessel belonging to the Great Central Co-operative Engineering and Shipbuilding Company, Limited, Grimsby.

It is understood that primarily they are to be used in connection with the discovery of submarine mines, which might be laid down in time of war. Ever since the Russo-Japanese war the terrible destruction that an enemy may inflict at trifling cost on a strong naval power by means of widely-sown submarine mines, has been fully recognised, and naval authorities everywhere have been studying possible methods of meeting the danger.

It was in these circumstances that the British Admiralty hit upon the ingenious notion of experimenting with the long trawl nets of North Sea steam trawlers. It was believed that trawlers, drawing, say, ten or twelve feet, could manœuvre in the vicinity of submarine mines much better than heavier draught vessels, and that the long shield of the trawl, operated by skippers who are practical enough to sweep any particular base of the ocean depths, would make them ideal in bringing up mines or catching any which have broken adrift.

Accordingly, some time ago, two Grimsby trawlers, the *Algoma* and *Andes*, were engaged by the Admiralty to carry out a series of experiments in the English Channel and Dover Straits, with a view to ascertaining how far the modern trawl which sweeps the bottom of the sea, is adapted to fish up a submarine mine or to render one useless by dislodging it from its moorings.

The experiments were kept as secret as possible, and when the vessels left Grimsby it was merely announced that they had been specially fitted out for the purpose of exploring some new fishing grounds.

Dummy mines were laid by a gunboat at various depths, inside and outside territorial waters, and the experiments of the two specially chartered trawlers proved eminently successful, numerous dummy mines, partly and wholly submerged, being swept up in such a business-like manner

A Typical Modern Steam Trawler.

as to very largely reduce the offensive possibilities of live mines. Similarly successful experiments were carried out in the northern waters, particularly in the Firth of Forth and St. Andrew's Bay.

Only a very few years back a steam trawler could hardly have survived the sudden discovery of a floating mine in the manner indicated. But in the rapid development of these vessels the length of the work has grown longer and longer, until now something like a thousand feet has been reached in some cases, so that the length of the warp from the vessels places the latter beyond danger in the event of an unexpected explosion. The more modern trawler, therefore, with certain adaptations, is eminently able to fulfil the requirements stated in the beginning by the naval authorities. On that account the announcement that several large and newly-built vessels of the modern type have been purchased by the Admiralty is not so surprising, and though the complete results of the experimental operations are being kept secret, these recent purchases plainly indicate that the latter have been to the satisfaction of the naval experts of the Admiralty.

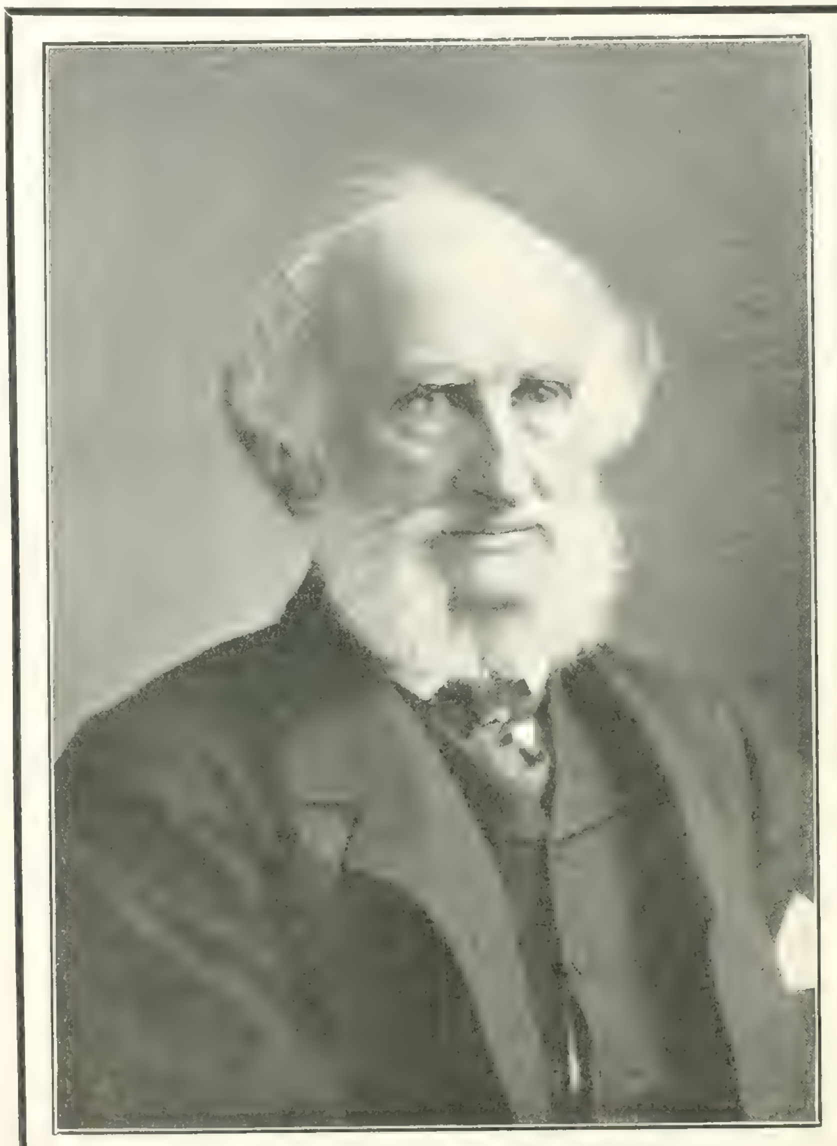
It is understood that negotiations are still pending for the purchase of more such vessels at Grimsby, and it is also thought possible that light draughted warships may subsequently be fitted with a specially-made trawling apparatus, as a result of the experiments.

OBITUARY.

Sir Donald Currie, G.C.M.G.

IT is with great regret that we record the death of Sir Donald Currie, G.C.M.G., head of the firm of Donald Currie & Co., managers of the Union Castle Line. The death took place on Tuesday, the 13th of April, at the Manor House, Sidmouth, Devon, where he had been staying. His health had been failing for some time past, but it was not until two days before his death that his condition became serious. Born at Greenock in 1825, he was consequently in his eighty-fourth year, but in spite of his great age he, up to the time of his illness, took an active interest in business affairs.

At the early age of fourteen Donald Currie entered a shipping office, in his native town, and about five years later his industry, honesty of purpose and ready capacity, which have distinguished him throughout his long life, secured him a position in the recently-established Cunard Line in Liverpool. Here he did good work, and was sent to Havre to organize the Company's service between France and America *viâ* Liverpool. He established branch offices at Bremen and Antwerp, and returned to Liverpool from the Continent and remained with the Cunard Company until 1862. His ambition having then been for some time past to become himself an owner of ships, he in the year above mentioned established the Union-Castle Line between Liverpool and Calcutta, making this a regular service—a great consideration for business men—instead of the haphazard sailings with which previously they had had to be content. In 1872 he inaugurated a service of steamships between Southampton and the Cape, and thus the monopoly which the Union Line had enjoyed so long was ended, and



The late Sir Donald Currie, G.C.M.G.

when the contract with the Union Line for the mail service expired the colonial authorities divided the new contract between the two Companies. A few years later saw the amalgamation of the two lines under the name of the Union-Castle Mail Steamship Company, with Messrs. Donald Currie & Co. as managers. The Cape having become the centre of his energies, he devoted himself to the study of South African interests, and he rapidly acquired a reputation as an authority on South African problems. Upon complications arising in South Africa in connection with the settlement of the diamond fields dispute his assistance was sought, and for this and his valuable help in the Orange Free State boundary question—of defining the boundary, arranging terms of settlement and drawing up the agreement—he was rewarded by having conferred upon him the honour of C.M.G. in 1877 and receiving the grateful acknowledgments of the Orange Free State Parliament. In 1881 he was made a K.C.M.G. for the assistance he rendered with regard to the transport of troops to South Africa during the Zulu war.

During the course of his long life he received many honours, and in 1897 was raised to the honour of G.C.M.G.; he was also in the Commission of the Lieutenancy for London. He sat in Parliament for Perthshire 1880-1885 and for West Perthshire 1885-1900, and enjoyed the friendship of Mr. Gladstone, who on several occasions was a guest on one or other of the Cape liners.

More than once during his life Sir Donald Currie made large gifts to public objects, among which will be remembered the splendid gift of £100,000 to the University College, London, stipulating that £80,000 should be used for the erection of new buildings for the medical school and £20,000 for the new nurses' home.

Sir Donald married in 1851 Margaret, daughter of Mr. J. Miller, who survives him. He also leaves three daughters.

The funeral took place on 20th April at Fortingall, Perthshire, and a memorial service was held in the Chapel of SS. Michael and George, St. Paul's Cathedral.

We learn that the Government of Cape Colony has sent a telegram of condolence to Lady Currie, and the news of his death has been received with sincere regret throughout South Africa, where he was much admired. In respect to his memory the Natal Government Agency in London flew its flag at half-mast.

LLOYD'S REGISTER—CHANGES IN GLASGOW STAFF.—Many changes are being made in the staff of Lloyd's Register in consequence of an exceptional number of its officers having reached the age limit about the same time. Among these, two transfers to the Glasgow district are of outstanding interest. Mr. J. H. Heck is to fill Mr. Mollison's place as principal engineer surveyor. Dr. J. Brahn, B.Sc., fills the position of senior ship surveyor vacated by Mr. Sinnette. Mr. R. N. Maclaren goes from Glasgow to London, Mr. A. M'Keand to Newcastle, Mr. J. Dickel to Aberdeen, Mr. D. M'Auslan to West Hartlepool, and Mr. R. Elliott to Southampton. On March 27th the Scottish staff of Lloyd's Register met at a complimentary dinner to Mr. James Mollison, Mr. Sinnette and Mr. House, all of whom are retiring. Mr. T. J. Dodd, principal surveyor, of Glasgow, presided.

NAVAL MATTERS—PAST AND PROSPECTIVE.

(From our Own Correspondents.)

Portsmouth Dockyard.

THE battleship *Neptune*, although she was not commenced until the middle of January, has made wonderful progress, the large entry of workmen in the winter having enabled the constructive department to considerably expedite the work. The vessel is to embody some important improvements on the *Bellerophon* and the *St. Vincent*. One new feature will be that she will be able to fire eight guns astern instead of six, this being secured by building the forward of the two stern barbettes higher than the other, thus allowing the guns to be fired over it. The *Neptune* will probably be launched by the end of August. The new armoured vessel, to which I referred last month, will not, it is understood, be laid down until November, but when once on the stocks she will be pushed on vigorously. It is anticipated that workshops will be built on Whale Island for the construction of the airship allowed for in the Estimates, but nothing official has been made known. An airship is being built by two officers of the *Mercury* at the Haslar experimental works. Strict secrecy is, of course, being observed in connection with the matter. Dr. Macnamara paid us a brief visit at the beginning of April, but it was quite private. He spent most of his time at the new lock works, which, it may be mentioned, are progressing very slowly; the number of men employed being comparatively small. The cruiser *Amethyst* has not yet left for the South-east Coast of America. On March 22nd she was leaving the harbour during a fog; a dockyard tug had just cast off from the battleship *Illustrious*, which was entering, when the bow of the tug struck the *Amethyst*. The cruiser returned and was placed in dock, her stem having been bent and some plates above the water line on the port side damaged. The cruiser *Furious*, tender to the torpedo school ship *Vernon*, left on April 25th on an experimental cruise on wireless telegraphy duties, visiting Port Vivero, Gibraltar and Madeira; she is to return on May 19th. The Home Fleet and the the Atlantic Fleet are to assemble at Spithead by June 10th preparatory to the manœuvres, and it is understood that the combined fleet will be reviewed by either the King or the Prince of Wales. Altogether there will be about thirty of the most modern battleships and about forty cruisers, in addition to a large flotilla of destroyers. The fleet will remain at Spithead for a week and then proceed to sea for the manœuvres, which are to commence on June 17th. The salvage operations of the destroyer *Blackwater* are being undertaken by the authorities of this yard under the supervision of Captain Fawckner, the King's Harbourmaster, assisted by Lieutenant Damant, the inspector of diving. The steam mooring lighter *Recovery* and a salvage party, the diving vessel *Raven* with divers, Torpedo Boats Nos. 4 and 20, and a steam tug are engaged on the work. The cruiser *Edgar* remains on the spot until the operations are concluded. Rear-Admiral Tate will succeed Vice-Admiral Robinson as admiral superintendent on May 9th. Another change, which was quite unexpected, has taken place, Captain Tottenham, captain of the yard and deputy superintendent, having gone to the battleship *Implacable*, the captain of that vessel, Captain Fawckner, having come here. It is understood that the exchange was made so as to allow Captain Tottenham to put in the required sea service to qualify for promotion.

Sheerness Dockyard.

It does not appear as if the reconstitution of the Home Fleet will do us very much good at Sheerness, for after having been the headquarters of that fleet the port is only to be the headquarters of the Third and Fourth Divisions, most of the vessels belonging to which are at Portsmouth and Devonport. A special service battleship division is to be constituted at the Nore, consisting of the *Glory* and *Goliath*, which recently returned from the Mediterranean, with the *Trafalgar* as parent ship. The latter vessel, which is attached to the Chatham Gunnery School for turret drill, is

to be replaced by the *Vengeance*. The division may be added to later on, but at present only the above three vessels are ordered to join it. The cruiser *Indomitable* left here on April 20th for the Firth of Forth, to join the Home Fleet for the exercises. Four arrests have been made at Portsmouth in connection with the recent robbery, one of the men being a petty officer of the vessel. The sinking of the destroyer *Blackwater* has been the chief topic of late. News of the disaster reached us by wireless on April 7th, and a few hours later the scout *Forward* came into harbour with the crew of the ill-fated vessel, who were taken on to Chatham. The *Forward* left next day with two divers for Dungeness, the scene of the wreck. The *Blackwater*, which is lying about five miles from the shore, left Portland with the Second Flotilla (late the Channel Fleet Flotilla) on April 7th for Cromarty, to take part in combined exercises with the First Flotilla, and late at night came into collision with the steamship *Hero*, of Bristol. Happily none of the destroyer's crew were lost. It is only about a year ago that a sister vessel, the *Gala*, was cut in two in the North Sea, and on that occasion Engineer-Lieutenant Fletcher lost his life. The *Isla*, which was purchased eighteen months ago for conversion into a petrol carrying vessel for submarines, has since been used as a collier, but she is now to be fitted for the duties for which she was intended. The plans for her conversion have been modified to meet the latest shore storage arrangements for petrol, and the work is to be carried out with the utmost despatch. The job has obviated the necessity of discharging a number of the additional men taken on during the winter. The destroyers are getting gradually out of hand and Commodore Charlton had his flotilla nearly at full strength for the exercises, only the *Wear* and *Cherwell* being in dockyard hands out of the twenty-four vessels composing the First Flotilla. The ocean-going destroyer *Amazon* has arrived from the works of Messrs. Thornycroft & Company, and has been commissioned, and the *Saracen* is shortly expected from Messrs. White and Company, Cowes. All the vessels of this class are to join Commodore Charlton's Flotilla. The *Wizard* was undocked on April 5th, after being in dockyard hands for five months, and has rejoined the Nore Flotilla. The steam trawler *Josephine* arrived on April 8th from Fleetwood, she having been purchased by the Admiralty for service as one of the tenders to the Torpedo School. The *Osprey*, another Fleetwood trawler, has been purchased for similar service, as has also the *Assyrian*, a new vessel belonging to the Great Central Co-operative Engineering and Shipbuilding Company, Grimsby, which is being fitted out at that port. In all five steam trawlers have been bought lately, the others being the *Arizona* at Grimsby and the *Nunthorpe Hall* at North Shields. Commander Wilde, the coaling officer at this port, recently effected an improvement in the organization and methods of working, which has contributed to an increased output of coal from colliers discharging. It is satisfactory to know that he has been complimented by the Admiralty for his zeal and energy.

Chatham Dockyard.

Although it is more than likely that nothing larger than tugs or submarines will ever be built at Chatham in the future, it is interesting to note that our new slip was included in the list of seventeen which the First Lord recently referred to in the House of Commons as being available for vessels of the "Dreadnought" class. It seems surprising that after making an up-to-date slip, with all the necessary buildings and machinery for the rapid construction of a larger vessel than had previously been laid down here, it should only be utilized for the building of tugs and small yard craft. The battleship *London* has come in for refit, this being the first extensive refit she will have had since hoisting the pennant seven years ago. The amount allowed is £74,609, which is the largest total for any vessel now refitting, with the exception of the battleship *Venerable*, whose repairs are put down at £75,195. Submarine *C* 19 was launched on March 20th, the naming—or numbering—ceremony being performed by Mrs. De Salis, the wife of the deputy-superintendent. Vice-Admiral Giffard, Captain De Salis, and the principal officers of the yard, together with a few ladies, were present. The vessel is 135 ft. in length, and has a breadth of 13 ft. 6 in. The weight of her hull is 120 tons, and when submerged she will have a displacement of 321 tons. Her engines will develop 600 indicated horse power, and this will give a surface speed of 13 knots. The boat was subsequently taken into dock, where her machinery, which is to be built here, will be fitted. *C* 19, which was laid down in June, is the third of her class to be constructed on No. 7 slip. It is expected, now that we are getting accustomed to the work, that the rate of construction will be accelerated. The six submarines laid down here are of similar design, but there is a small difference in the engines of *C* 19 and *C* 20 as compared with *C* 17 and *C* 18, the object being to provide more room in the interior of the two former boats. It is quite likely that further changes may be introduced in the two vessels to be laid down this year, indeed, there is talk of building a much larger vessel, but nothing official is known. The cruiser *Topaze*, which flies the broad pennant of Commodore Charlton, commanding the First Destroyer Flotilla—late the Eastern Group—has come in for a refit, and the commodore has hoisted his pennant in the cruiser *Blenheim*. The cruiser *Blake*, the depôt ship of the Nore Destroyer Flotilla, is to replace the *Tyne* as depôt ship of the Second Flotilla at Portland, the latter vessel taking over the duties of the *Blake*. The destroyer *Falcon*, after being in dockyard hands for four months, proceeded on April 13th to Sheerness, to complete preparations for joining the Second Flotilla in Scottish waters. Torpedo Boats Nos. 21 and 22 have been delivered from the works of Messrs. Hawthorn, Leslie & Company, Hebburn-on-Tyne, and have been commissioned for service in the Nore Flotilla. The rumour that Rear-Admiral Ommanney is to succeed Vice-Admiral Giffard as admiral-superintendent was somewhat premature. Admiral Giffard's two years expired in February, but he has been granted a six month's extension, so that he will not leave until August.

Devonport Dockyard.

The whole of the eighteen water-tube Yarrow boilers have been placed in the battleship *Collingwood*, the work of transporting, hoisting in, and fixing having been accomplished in less than six working days, which is considered a very good performance, seeing that each of the boilers weigh about thirty tons. The 75-ton electric revolving crane was used for lifting the boilers, and this considerably expedited the work. The greater part of the machinery and fittings have been delivered and are being shipped, in readiness to move the vessel at the end of April to No. 1 Jetty in the South Yard, where her tripod masts and funnels will be hoisted in. I stated last month that the battleship *Temeraire* was to be commissioned about the end of May, and it has now been announced that the 15th of that month is the date selected. Good progress is being made with the construction of the armoured cruiser *Indefatigable*. Large quantities of material are being prepared, and everything points to the rate of progress being maintained. The battleship *Hibernia*, the flagship of Rear-Admiral Startin, second in command of the Second Division of the Home Fleet, has been taken in hand for her annual refit, and the admiral has temporarily transferred his flag to the *New Zealand*. The armoured cruiser *Warrior* is also in hand, the work to be done including the fitting of magazine cooling plant and the provision of a lower fire-control position behind armour. She is expected to be completed by the end of June. The equipment of the battleships *Majestic* and *Hannibal* is to be brought up-to-date by the substitution of the latest type of steel sighting-hoods for those now mounted on the crown of the barbettes. The coal hulk *Himalaya* is to be improved by the fitting of additional Temperley transporters. At present the hulk is provided with one 75 ft. mast, fitted with sets of transporters, and she is to have two others, fitted with double sets of apparatus. The cruiser *Pelorus* arrived on April 5th and will shortly be taken in hand for an extensive refit. Since leaving Simon's Bay the vessel has steamed about 17,000 miles in five months, and was under way on 103 days out of 186. Her voyage up the river Amazon has created quite a stir. An account of the cruise is shortly to be published, which should prove most interesting reading to every seafaring man. The work of converting the old torpedo gunboat *Onyx* into a depôt ship for submarines is practically completed, and the vessel will take up her new duties shortly. The refits of the destroyers *Arab* and *Mermaid*, of the old Channel Fleet Flotilla (now the Second Flotilla of the Home Fleet) are nearly completed. There are half a dozen vessels of the flotilla in hand. The *Leven* and *Ostrich*, which came into collision off the Scilly Islands, are being put right. The

former, which was dealt a glancing blow by the *Ostrich*, had some of her plating at the bows damaged, but the injury to the *Ostrich* was less serious. The *Kennet* came in on April 7th in a partially disabled condition, her port air pump having broken. Engineer Rear-Admiral North has retired after just over thirty-eight years' service. He was on the staff of the Commander-in-Chief at this port, and was succeeded a couple of months ago by Engineer Rear-Admiral Elbrow. Another officer who was well known here has taken his retirement—Engineer-Captain Barry, who left on promotion in September last, at which time he was in charge of the torpedo store. Engineer-Commander Emdin is relinquishing the post of first assistant to the engineering manager on the completion of his three years. His successor is Engineer-Commander Fergusson, from the cruiser *Hermione*, on the Cape of Good Hope station. Captain Lockyer, who has been King's Harbourmaster for the past three years, has also left, he having been succeeded by Commander Strickland.

Pembroke Dockyard.

As briefly stated last month, the *Bellona* was launched by Lady St. Davids on March 20th. Captain Mundy had charge of the arrangements, which were carried out without a hitch, and as soon as the slip was afloat she was taken charge of by Staff-Captain Moulton, the King's Harbourmaster. The *Bellona*, which is an unarmoured cruiser designed for scouting and patrol work, is similar in design to the *Boadicea*, but has 6 in. more beam and 30 tons more displacement. She will be fitted with turbines capable of generating 18,000 horse power, estimated to give her a speed of 25 knots, and the machinery will be supplied by the Fairfield Engineering Company, of Glasgow. The turbines and boilers are now being placed in position. Her steam trials will, it is stated, take place in August and her commissioning trial in October. The first keel plates of the new unarmoured cruiser "No. 1" were formally laid in position by Mrs. Mundy, wife of the Captain-Superintendent, on April 12th The ceremony was performed by touching a button, which worked an electric motor, this causing the plates to be drawn down an incline on to the blocks. The first rivet was afterwards driven and hammered down by means of a pneumatic riveter, this also being operated by Mrs. Mundy, other rivets being similarly treated by other ladies. Mr. Pledge, the chief constructor, directed the proceedings. The vessel will be of the *Boadicea* class, similar externally to the *Bellona*, but somewhat different internally, mainly in the machinery spaces. Her principal dimensions will be :—Length, 385 ft. ; extreme breadth, 41 ft. 6 in. ; mean load draught, 13 ft. 6 in. ; and displacement, 3360 tons. She will be fitted with turbines of 18,000 horse power, which is expected to give her a speed of 25 knots. Her armament is to consist of six 4-in. quick-firing guns, and she will have two deck torpedo tubes. The construction, it is understood, is to be expedited, so as to allow of the vessel to be launched in October. The *Boadicea* left on March 26th for her steam trials, all of which have been completed most satisfactorily. She conclusively demonstrated the exceptional utility of oil fuel, which was burnt throughout in combination with fuel. A speed of 27·9 knots is said to have been attained during one quarter of an hour. The vessel returned from Plymouth on April 15th. About 180 men who had been temporarily entered were discharged on the last day of March, 53 of them being re-entered the next day, but before being re-engaged they were required to produce indentures or certificates of apprenticeship. The men were required mainly for the refits of the destroyer *Violet* and the torpedo gunboat *Thrush*. Mr. Macnamara, the Parliamentary Secretary to the Admiralty, paid us a visit on April 15th, accompanied by other members of the Committee appointed by the Admiralty to inquire into questions concerning the writing staff of the dockyards. Each writer was personally interviewed. Mr. Macnamara also visited some of the working departments, and questioned the men as to their duties and the conditions of their employment. Two more of the camels have been sent round to Dover, and we are shortly to take in hand some other outside work, orders having been received for two floating targets. They are intended for battle practice, and each of them will be about 140 ft. long.

THE SUCTION DREDGER "LEVIATHAN."*

By Anthony G. Lyster, Esq., and W. Boyd, Esq.

This dredger, which has been built by Messrs. Cammell, Laird & Co., at their Tranmere Shipyard, is of the twin-screw self-propelling hopper type, having a net hopper capacity of 180,000 cubic feet and capable of filling herself with 10,000 tons of clean Mersey sand in 50 minutes from a maximum depth of 70 ft.

The principal dimensions are :—

Length	..	465 ft. 9 in. between perpendiculars.
Breadth	..	69 ft. 0 in. moulded.
Depth	..	30 ft. 7 in.

Under ordinary working conditions and in normal steaming trim, with the full load of 10,000 tons of sand in the hoppers, and with coal bunkers and water tanks full, the vessel is capable of travelling at the rate of 10 knots, the mean draught being 23 ft. The propelling machinery of the ordinary triple-expansion inverted marine type, with cylinders $22\frac{1}{2}$ in., 37 in., and 61 in. dia., and 45 in. stroke, is by D. Rowan & Co., Glasgow, who also supplied the boilers, four in number, 16 ft. dia. and 11 ft. 9 in. long, working under a pressure of 180 lbs. per sq. in. with natural draught.

The framing and plating are of steel throughout, and the scantlings generally have been arranged to meet the requirements for the 100 A1 Class in Lloyd's Register.

There are eight complete athwartship watertight bulkheads extending to the upper deck, and five others which are watertight inside the hoppers only. There is also a centre line watertight bulkhead which extends from the fore end of the buoyancy space immediately in front of the hopper to the after end of the boiler-room, thus dividing the hopper into twelve watertight compartments. The total number of watertight compartments in the ship is twenty-five, and they have been arranged with a view to complete safety, should any two compartments become flooded. All the usual and necessary watertight doors and passages have, of course, been provided.

The hopper itself is 162 ft. long, and is 49 ft. wide at the deck level ; each of its twelve divisions has thus a section at its upper part of 27 ft. fore and aft by 24 ft. 6 in. athwartships. This rectangular section extends for a depth of about 20 ft., from which point the four walls of the compartment are sloped inwards, until they reach the bottom and terminate at the edge of the valve discharge opening, which is circular and 5 ft. 6 in. diameter. The side walls of the hopper, which are also watertight, form the inner walls of the side buoyancy spaces as shown.

The main idea of dredging and depositing the sand is simple enough—that is to say, sand and water are sucked up from the dredging level through long pipes by means of centrifugal pumps, and discharged by them into the hopper, where the sand settles to the bottom and the water is allowed to flow overboard from the top. The sand is finally discharged from the hopper in the desired locality by means of the discharge valve openings in the bottom of each compartment. It is, however, in the detailed arrangement, by means of which this simple programme is carried out on an immense scale, that the interest lies.

The dredging machinery consists of four centrifugal pumps specially constructed by Gwynnes, Limited, of London, for pumping sand, each pump being driven by a separate set of engines, and having a separate suction pipe fitted to the side of the vessel. This machinery is situated in the pump room immediately abaft the hoppers, the suction pipes being led where necessary through the side buoyancy spaces to the openings in the sides of the vessel.

The engines are of the inverted triple-expansion surface-condensing marine type, with cylinders 15 in., 25 in., 40 in. by 18 in. stroke, working at 180 lbs. pressure, and each set is directly coupled to its corresponding pump.

Each of the four pumps has a suction and discharge aperture of 42 in. diameter, the suctions being of the double inlet type. The casings are of cast iron in halves, with portable centres

* Read at the Spring Meetings of the Fiftieth Session of the Institution of Naval Architects, April 1, 1909.

on each side for the removal of the impellers, which are of cast steel and 6 in. wide at the tips of the blades. A sluice valve operated hydraulically is fitted between each suction

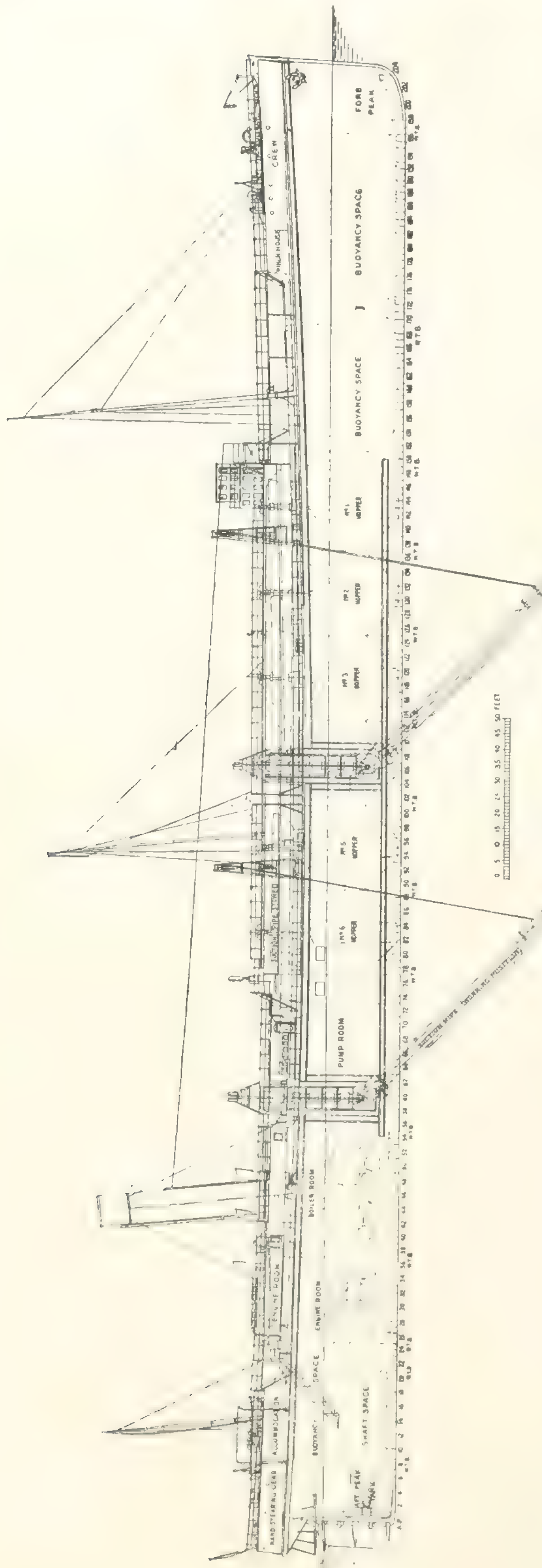


Fig. 1 Profile

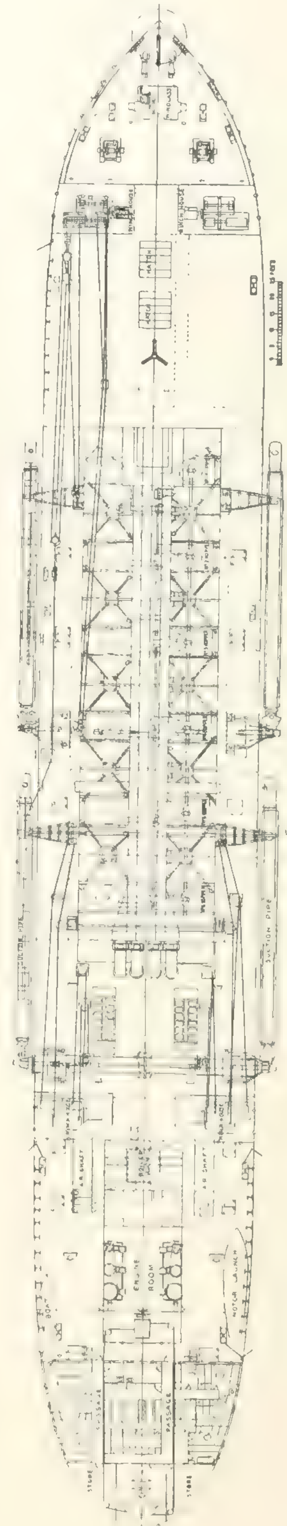


Fig. 2 Deck Arrangement The Suction Dredger *Leviathan*

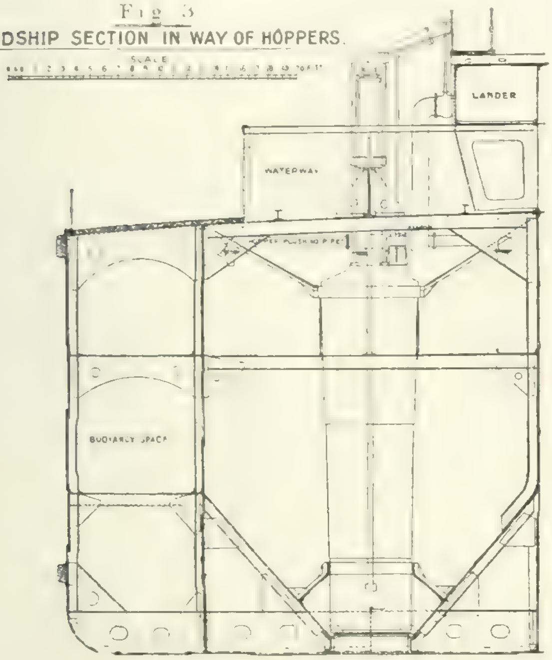
and the ship's side, the lever and rods for working being brought within easy reach of the starting platform.

One of the most important points in the whole of the

dredging system, and one which may be regarded as vital for the successful working of the dredger, is the design and arrangement of the suction tubes and their attachment outside of the vessel. They are four in number, two on each side of the vessel, situated as indicated on Fig. 2. It will be seen that the lead of each tube is forward, and they are of such a length

Fig 3

MIDSHIP SECTION IN WAY OF HOPPERS.



as to enable dredging to be efficiently done in a maximum depth of water of 70 ft., the depth being measured from the surface of the water to the surface of the sand; the angle of inclination of the tube does not exceed 45° below the horizontal when dredging at the maximum depth.

These tubes are made of wrought steel boiler plates, the top half of the circumference being $\frac{8}{20}$ in. thick, and the bottom $\frac{9}{20}$ in., with the circumferential joints quadruple riveted with single outside straps. Within each tube a mid-feather plate is fitted for three-fourths of the length, extending at the sides between the angles connecting the upper and lower halves of the tube. An elm rubbing piece fitted between large angles runs along each side of the pipe, and a fender plate extends for a length of 30 ft. on the rubbers, where chafing is likely to occur against the ship's lower side rubber.

At each end of the tube cast steel flanges are riveted for the purpose of connecting it to the swivel-joint and nozzle. The nozzle itself consists of a cast steel flange and end grating, with a wrought steel body efficiently stayed. Elm rubbers are fitted on each side, and a manhole with cover is provided, whilst on the upper side of the tube near the nozzle there are suitable lifting brackets of forged steel.

As it was necessary to arrange for a lateral motion of the nozzle as well as a vertical one, the joint forming the attachment of the tube to the ship's side needed special and careful treatment in its design. It is formed by a cast steel swivel band, held up to a cast steel sliding flange by a ring of the same material, secured by steel studs and gun-metal nuts suitably locked. There is a heavy horn bracket with a brass bushed bearing for supporting the outer end and for lifting, and the swivel portion is of cast steel, with large bearing pins working on adjustable bearings.

The upper bearing and bracket are removable for overhauling, and are fitted with recess and spigot to secure alignment. This bend acts as a trunnion or hinge, by which the tube is free to turn either about a vertical or horizontal axis, whilst the sliding flange works in a cast steel frame riveted to the ship's side, the guide bars being of wrought steel. By this means the tube can be raised bodily to the deck level, and brought inboard, where provision is made for stowing it.

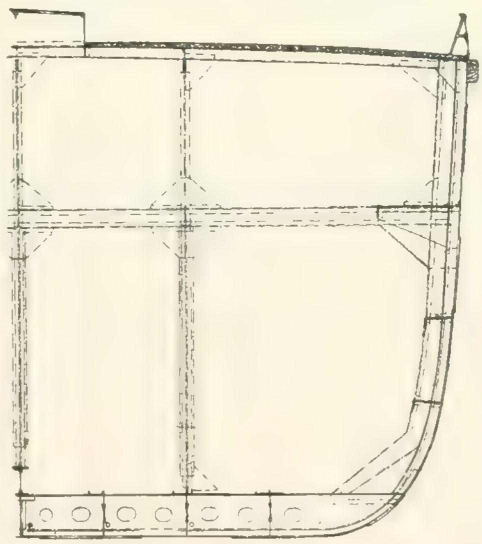
The raising and lowering of each tube is effected by two derricks, one at each end of the tube, both being worked from the same steam winch on deck. In connection with these jibs special cradles are provided to carry the frame supporting the swivel bend, with screw gear to move the cradle inboard or out as required. All the fittings in connection with the jibs are specially strong and an emergency gear is provided for each tube, so that in case of a breakdown of the suspension rope or attachment to the suction head when the tube is below the water, the tube can be easily raised again. The gear consists of a spare length of wire rope, stowed, when not in use, along the outside of the tube. One end is attached to the suction head at the bottom and the other accessible from the deck when dredging is going on, a special sheave and lead to the winches being also provided on deck.

The four winches necessary for manipulating the tubes are each provided with four drums arranged in pairs, two for moving the derricks in and out, and two for raising and lowering the tubes, and are actuated by double cylinder reversing steam engines. Each drum can be driven separately, and is capable of exerting a direct pull of 10 tons, and the machinery is so arranged that one man can control the whole of the movements required to be made by a suction tube, that is, adjustment in dredging position, hoisting, and bringing inboard. These operations are directed by a "tubeman" at each tube, stationed at the ship's side directly over the place where the mouthpiece is located. This man constantly takes soundings by means of a line attached to the suction head and also watches the vacuum obtained in the pumps, a very variable quantity, varying from 5 in. to 15 in., which is indicated on the gauge placed conveniently near. By these observations he is enabled to give the necessary directions to the winchmen for the manipulation of the tubes to keep the suction head up to its work with the maximum efficiency.

The mixture of sand and water on leaving the pumps is discharged through two ducts or "landers" of rectangular section extending the full length of the hoppers. These landers run side by side, their common centre wall being an

Fig 4

SECTION THROUGH FORWARD BUOYANCY SPACE



upward extension of the centre line bulkhead; they are each 6 ft. wide by 4 ft. 3 in. deep, and are supported by brackets attached to strong thwartship beams. The bottom of each lander is covered with cement 2 in. thick, with a view to protecting the steel from the scouring action of the sand.

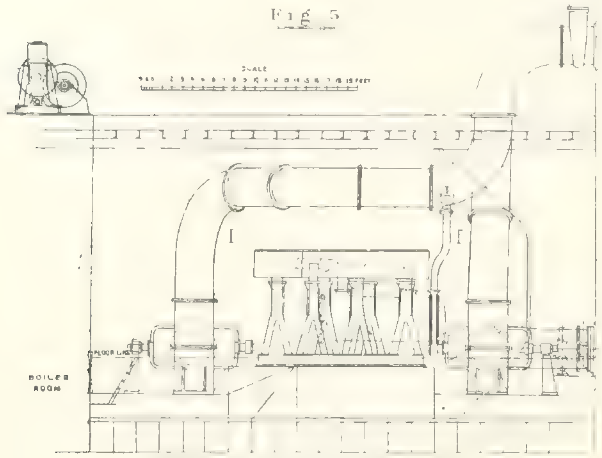
The admission to the hoppers takes place through gate valves in the bottom of the landers; there are two to each compartment with the exception of the end ones, and the openings are rectangular 2 ft. 6 in. by 11½ in. At the extreme forward end the landers spread out in section to the full width of the hopper in order to lessen the velocity and shock on the end bulkhead.

on the completion of the load; the interior of the hopper valves being, of course, open to the sea.

The hydraulic installation is necessarily of a powerful kind, and consists of one set of inverted high-pressure condensing engines and three single-acting main pumps driven direct from piston rod crossheads. The pump rams are 5 in. diameter, the stroke 15 in., and the hydraulic pressure 800 lbs. per square inch, working with a steam pressure of 100 lbs.

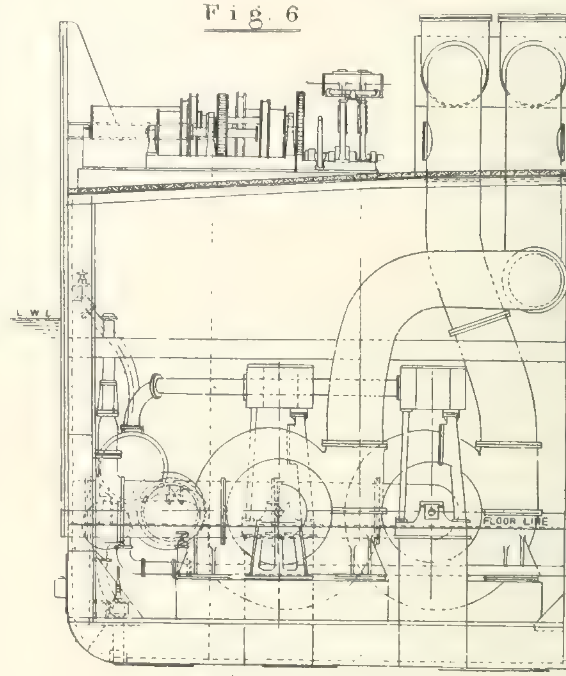
Arrangement of Machinery in Pump Room.

Fig. 5



LONGITUDINAL SECTION ON CENTRE LINE OF SHIP
LOOKING TOWARDS PORT SIDE

Fig. 6



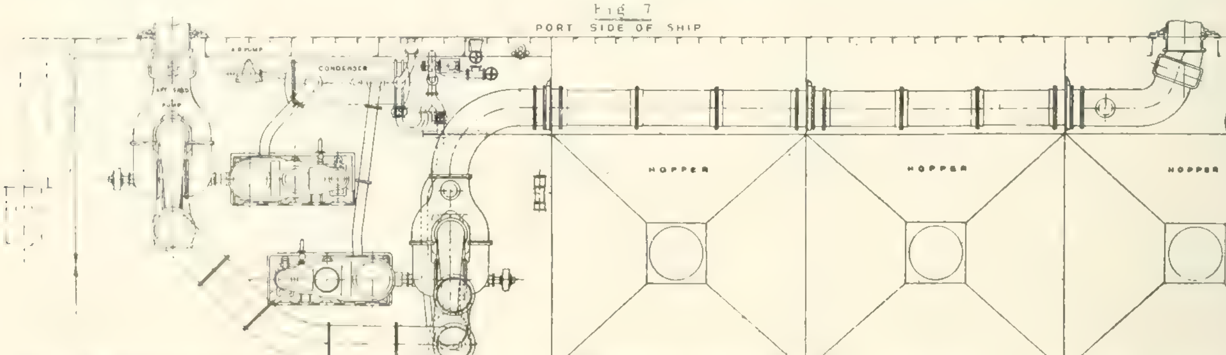
HALF SECTION AT FRAME No 57
LOOKING FORWARD

In order to obtain effectively a rapid settling of the sand in the hoppers it is essential that the velocity of the mixture should be reduced as nearly as possible to zero. Below the deck level in each of the twelve hoppers this takes place naturally, whilst above this level a coaming standing 7 ft. above the deck is provided all round the hoppers, forming a huge tank in which the large excess of surface water is brought virtually to rest. It is finally drained off over two weirs placed at the after end of the hoppers, escaping overside by means of four ducts, two on each side of the vessel. That this procedure is highly effective in separating water and sand may be seen by reference to Fig. 8, which shows the relative percentages of solid contained in the mixture whilst coming in through the landers and going out over the weirs during one loading of the vessel.

Owing to the tendency of the sand to consolidate and harden in the hoppers, a system of flushing pipes is arranged as shown in Fig. 3. By means of these the sand can be loosened in discharging and the hoppers effectively washed out. The water for this system is supplied by the main pumps from the "landers," each lander having a closing door near the forward end of the hoppers which permits the ordinary flow to the forward hopper to be stopped, and a pressure head created for the flushing system. The ordinary gate valves in the bottom of the landers are, of course, closed during the flushing operation.

Fig. 7

PORT SIDE OF SHIP



The process of discharging the sand from the hoppers, ordinarily known as "dumping," is carried out by means of Mr. A. G. Lyster's hydraulic valves, which have proved themselves so uniformly effective in other dredgers belonging to the Mersey Dock and Harbour Board. These valves are essentially large cylinders extending from the valve opening (5 ft. 6 in. diameter) in the bottom of each hopper to the deck level, and are operated by hydraulic rams, one to each valve, mounted on strong fore-and-aft girders as shown in Fig. 3, the lift of each valve being 4 ft. In the crown of each hopper valve is fitted a special "surface water" valve worked by hand, the function of which is to drain off the surface water remaining on top of the sand and below the level of the weirs

The efficiency of the means for getting rid of the sand may be judged from the fact that a load of 10,000 tons has been disposed of in the short space of ten minutes.

The vessel is lighted throughout by electricity, and the

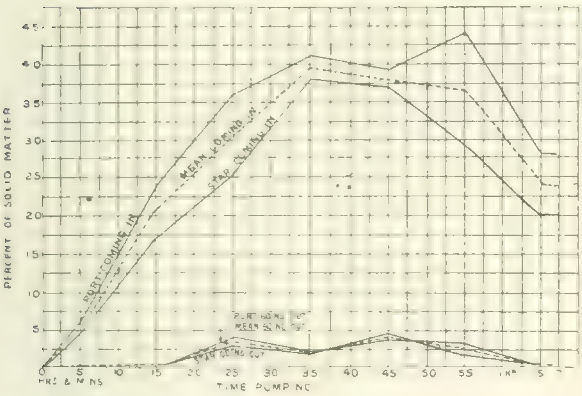
excellent accommodation provided for the working staff and crew, is a feature which will conduce very largely to the working efficiency of the dredger.

Ample spare gear is, of course, provided in view of the heavy and continuous nature of the work, and amongst other items might be mentioned the two spare suction tubes complete and ready for mounting which are kept in readiness.

Fig 8

LEVIATHAN

DIAGRAM SHEWING PERCENTAGE OF SOLID MATTER IN PUMP DISCHARGE AND OVERFLOW DURING THE LOAD



The trials of the vessel gave very satisfactory results. The average speed on the measured mile was 10·48 knots, and the consumption of coal on a six hours' run was 1·3 lbs. per I.H.P. per hour, as against 1½ lbs., the contract limit. The boiler power proved very ample, so that the steam required was fully provided without any forcing.

The sand pumping also gave very satisfactory results, although the material was not the "clean Mersey sand" to which the specification applies in the case of the trials, which requires the full load of 10,000 tons to be pumped in 50 minutes. On the occasion of the trials, pumping proceeded at a rapid rate until the pipes reached a stratum of material into which they would only penetrate very slowly, so that the rate of discharge fell off. Even under these disadvantageous circumstances the vessel loaded to within 7 per cent. of her full load in 50 minutes, and there is no doubt that in the specified material she will do the whole load in less than the time named. In the case of the Board's other dredgers the record loads have been done in the course of the ordinary work.

The pumping machinery as well as the propelling machinery worked well throughout.

REVIEW.

The Directory of Shipowners, Shipbuilders and Marine Engineers for 1909. London: The Directory Publishing Co., Ltd. (10s.)

We have before us a copy of the 1909 edition of the above useful book, which has been thoroughly revised and brought up-to-date. Fifty pages having been added to the present edition, it now contains 749 pages within its covers. As before the volume opens with an index of shipowners, shipbuilders and marine engineers, alphabetically arranged, first under names and then in order of towns. Following this comes the list of shipowners, which forms the bulk of the pages, with a list of ships with their tonnage, speed, builder and who engined by. We have then the list of shipbuilders and marine engineers, commencing with the British Royal Naval Dockyards. The boat index is very useful—after each boat appears the name of the owners. The volume closes with a personal index of directors, partners and chief officials. The information contained in the volume will be found very useful, and we recommend it as a handy book of reference within the limits of its title, to all those connected with the shipping industry and marine engineering.

THE SCHMIDT SUPERHEATER.

EVERY shipowner desires to obtain the maximum amount of power and efficiency with a minimum consumption of fuel. High steam pressures and multiple-expansion engines have achieved much in this direction, but it is undoubtedly true that the limit of efficiency with saturated steam has been virtually reached, and the triple-expansion engine as built to-day is very little more economical than the engine of fifteen years ago. Further advance is, however, possible by the adoption of superheating, which feature thus takes up and continues the development of the steam engine from the point at which compounding leaves it. Representing as it does the next progressive step, it is clearly manifest that superheating is indispensable as a means for securing an increase in economy and power; and not only is this increase easily obtained, but it is of such a striking character as to render the adoption of superheating a matter of necessity to every shipowner.

Scarcely any engineer of to-day would design a large stationary engine plant without making use of superheating, and it will be conceded that hardly any marine engineer will in future construct steam engines which do not work by means of highly-superheated steam.

It may be asked, Why is superheating not already in general use at sea? Marine engineers well know the many difficulties which in the past have stood in the way of the general adoption of superheating to steam vessels. Different engineers of high repute have endeavoured to solve the problem, but their efforts have only met with varying measures of success.

It is no exaggeration to say, however, that it was not until the introduction of the Schmidt system that steam of a very high temperature became at once practical and profitable, productive of a wider range of economy and efficiency than is possible with saturated steam without the attending difficulties which formerly prevented its general adoption.

It is estimated that in saturated triple-expansion steam engines the actual loss due to the presence of water in the engine amounts to 25%—50% of the quantity of coal used, varying with the cut-off and the speed at which the engines are worked.

On long continuous voyages, where high degrees of superheat can be steadily maintained, the best results are secured. The more the superheat boiler is forced the higher is the degree of superheat obtained, and the more economically the engine works; the more the saturated steam boiler is pressed the wetter the steam becomes, and the greater consequently is the quantity of water carried over to the cylinders, and so the engine works less economically.

Whilst a gain in economy can be obtained by the use of higher steam pressures, it should not be forgotten that high pressure means extra wear and tear, increase of first cost, maintenance charges and other discounting circumstances.

It may therefore be said that it behoves marine engineers to try whether moderately high pressures and moderately high superheating can be combined in order to obtain the highest economies.

Under all circumstances, and especially in the case

of new vessels, it is distinctly advantageous to secure the full advantages arising from the use of superheated steam of high temperatures.

It is found that the most economical results are obtained from the Schmidt system when a steam temperature of 600°F. to 650°F. is employed. With this steam temperature the coal consumption will be in the case of triple-expansion engines 15% to 20%, and in the case of compound engines 22% to 30% less than in similar engines using ordinary saturated steam.

In the case of old vessels superheaters giving a temperature of 500°F. can be fitted without any alteration to the engines or boilers, and the most timid need fear no trouble from their packings, nor need they be alarmed about evils arising from improper attention to lubrication.

in economy is obtained than when boilers are worked under natural draught. The reduction of the area through the smoke tubes caused by the insertion of the superheated tubes produces no diminution in the draught, as the quantity of coal which is burnt when using superheated steam decreases in a still larger ratio.

We illustrate in the adjoining diagrams in Fig. 1 the Schmidt system applied to a boiler with natural draught and in Fig. 2 one fitted with Howden's induced draught.

The superheater proper consists of collector pipes arranged either vertically between the nests of tubes, or horizontally above the tubes. In most boilers the former arrangement is preferred. These collectors are in two parts, one taking the saturated steam from

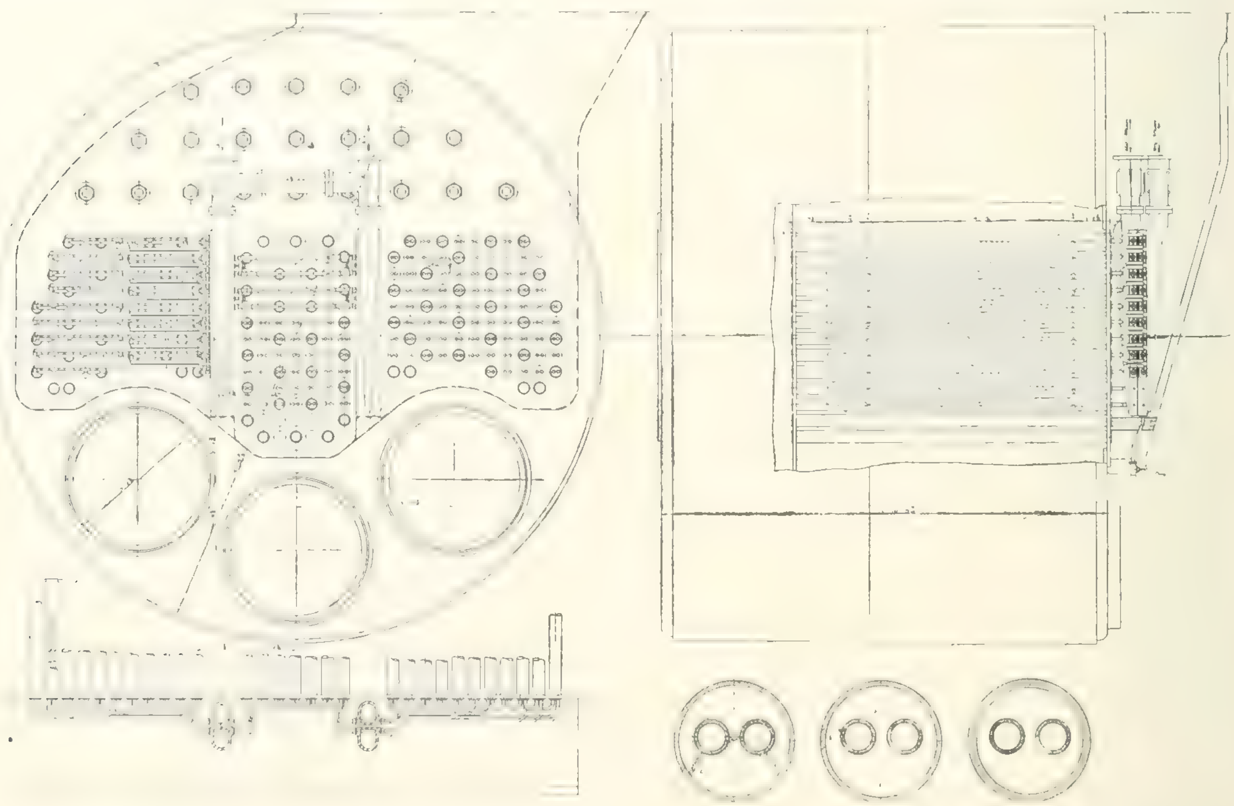


Fig. 1.

The ordinary shell boiler as built to-day has proved itself to be the most economical type of boiler at present in existence, and costs less than any other type of boiler for upkeep.

The Schmidt superheater has been specially designed to suit this form of boiler, and it can be applied as easily to boilers already built as to new boilers. It would therefore appear that existing vessels may therefore obtain the full advantage accruing from the use of superheated steam by the adoption of the Schmidt superheater, provided that the engines are fitted with a piston valve to the high pressure cylinders, and metallic packing is used for the high pressure piston rod and valve spindle. It is immaterial whether the boilers work under natural draught or forced draught, though in the latter case relatively less gain

the boiler and the other delivering the superheated steam to the engines. From these collectors the superheater pipes are led through the smoke-tubes flow and return. The hottest of the furnace gases meet the coldest part of the superheater, so that the pipes which have to withstand the hottest heat of the furnace gases are very effectually cooled. The ends of the superheater pipes where they join the collectors have a collar which forms a joint, and are held in place by a wrought-iron dog, secured with a single bolt. If by any chance one of the superheater pipes should become defective, the point of leakage can be immediately detected. By unscrewing two nuts the defective part can be removed, a blank flange placed over the hole, and the boilers may continue steaming without any detriment, the whole operation only

occupying a few minutes. When removing one of the elements it is only necessary to close the stop valves and blow out the steam contained in the collectors, the latter being fitted with a valve for this purpose, and for drainage.

The cleaning of the superheater and boiler tubes can be very easily and quickly performed by steam jets specially provided for the purpose, by which means the whole of the tubes can be cleaned as often as desired and in less time than that usually employed in hand brushing.

It is claimed that in no case does the application of the Schmidt Superheater render necessary an increase in the size of the boilers; on the contrary, for the same power obtained from the engines a smaller boiler, if fitted with the Superheater, may be used. engines in the ship with high-pressure boilers, or convert the old compound into triple-expansion engines with high-pressure boilers, or renew the boilers only, leaving everything as before. The latter course most engineers are loath to take, and they are frequently also very loath to go to a great expense in engine renewals. In such a case as this the problem is most easily solved by the adoption of superheating. The boilers can be renewed, making them of the same design as the old ones, and for the same pressure. If the engines are fitted with a slide valve, then if a high temperature of superheat is required it will be necessary to fit a new cylinder with a piston valve, or a moderate degree of superheat may be used with less economy in conjunction with the original slide valve. If a Superheater be fitted giving a steam temperature

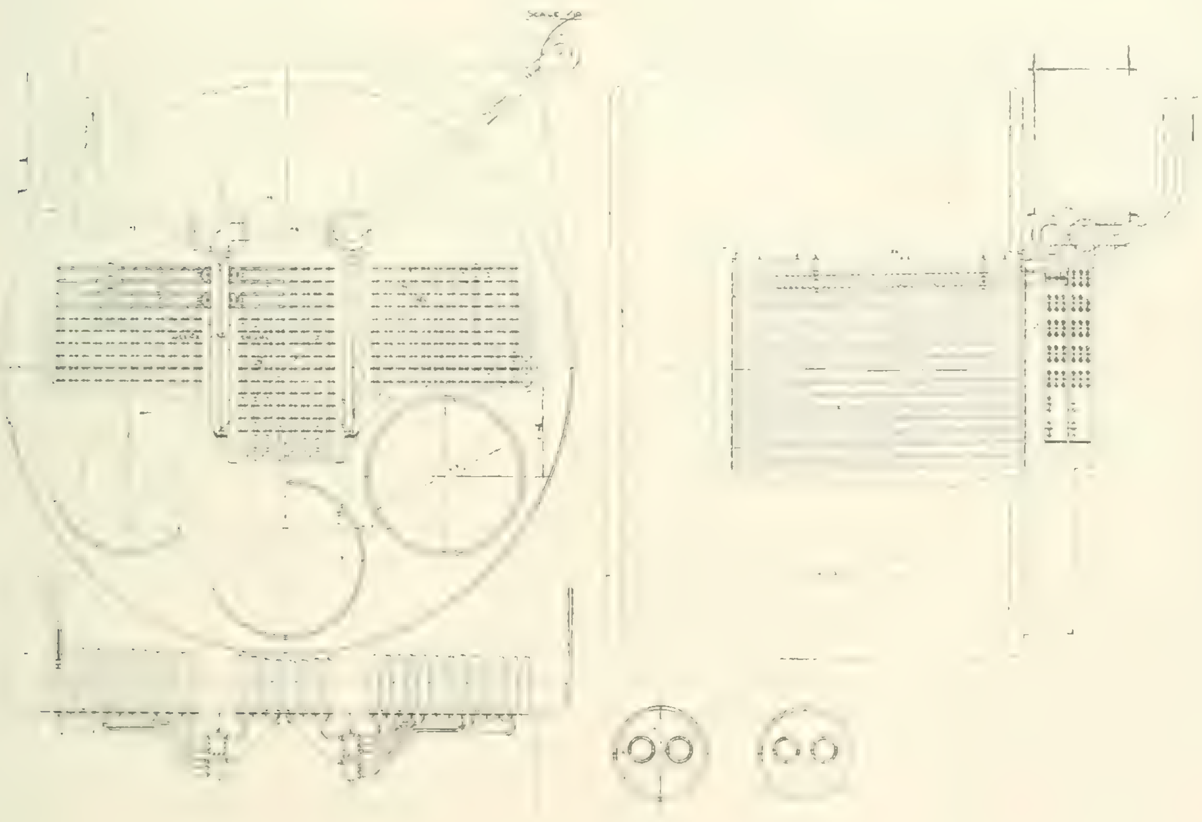


Fig 2.

If, for instance, an economy of 25 per cent. be taken, then a battery of three Superheater boilers would only be required instead of four non-Superheater boilers, or should no reduction be made in the number of boilers used, then a greater h.p. may be obtained and the speed of the vessel increased, or should this not be required, less expenditure of fuel will be necessary for the same power.

In the case of boilers which have hitherto been unduly forced, the application of the Superheater will not only produce more steam with less fuel consumption, but will result in less wear and tear and will consequently prolong the life of the boiler.

In the case of old ships with compound engines, whose boilers require renewal, the question frequently arises as to whether it is worth while to put new

of say 650° and a new cylinder with a piston valve be fitted, the machinery after this alteration will be equal in economy to a modern triple-expansion engine with high-pressure boilers non-superheating.

As an example of the advantage to be derived from the use of superheated steam, it may be mentioned that the paddle steamer *F. Haniel I.* (about 1,000 h.p.) was, after twenty years' service, fitted in 1905 with new boilers and Schmidt Flame Tube Superheaters (giving a superheat of about 570° Fahr.), together with a new high-pressure cylinder and piston valve, the engine remaining in all other respects unchanged. On a trial trip with the Superheater shut off, 22 cwts. of coal per hour were consumed, whereas for the same journey and load with the Superheater in use, only 16 cwts. were required. This vessel, owing to its

being equipped with a superheating plant, has thus become a thoroughly up-to-date and most economical boat, and though still compound, is equal in economy to the best triple-expansion engines not using superheated steam. It is very simple for the shipowner to estimate for himself how much more valuable this vessel has become after the adoption of superheating.

In using superheated steam it is needless to say that efficient lubrication is of the utmost importance, but the application of a positive system used in conjunction with Schmidt Superheaters makes this problem a very simple one. A special form of lubricator is fitted to the main steam pipes through which hydro carbon oil having a high flash point is forced by a mechanical lubricator and atomized in the centre of the main steam pipe. This oil passes with the steam to the working surfaces of the piston valve. The amount of oil required when efficiently applied only amounts to about 1½ pints per 1,000 h.p. per 24 hours.

With superheated steam it is in all cases necessary to use a well designed piston valve in the H.P. cylinder, this valve takes steam on the inside as in ordinary practice. It is also necessary to provide the high-pressure piston rod and the high-pressure valve spindle with metallic packing.

As superheated steam occupies more space than saturated steam per unit of weight, the cut-off in the high-pressure cylinder must be somewhat later when using superheated steam than would be the case if saturated steam were employed, but this small variation can easily be obtained in the valve gear without any alteration to the position of eccentrics.

We understand that over 100,000 H.P. has been installed on almost every type of vessel, naval and mercantile; it is therefore no longer an experiment.

It is important to note that the system can be fitted to existing boilers without any alteration to boilers, smoke box or funnel, and the speed of the ship increased or the coal consumption reduced, whichever the shipowners want. Further, we may add that the system entails no extra cost in maintenance and is specially designed to be a part of the well-proved cylindrical boiler. It is not an accessory, being as much a necessity as any other part of the boiler, while it not only reduces the number of firemen, but also reduces the first cost of machinery per I.H.P.

The system is being dealt with by Schmidt's Superheating Co., Ltd., of 28, Victoria Street, Westminster.

THE HUMBER.—Powerful Wireless Station almost complete.—At the entrance to the estuary of the Humber on the Lincolnshire coast, the latest Admiralty wireless telegraph station now stands outwardly complete, and only awaiting the switching on of the power and the installation of the necessary implements in the buildings near the nine tall masts. It is anticipated that they will be ready about the beginning of August, when it will be possible to send messages as far as Gibraltar in one direction, and St. Petersburg in another. Only one other station in the world, it is said, has been designed to carry the same power. The erection of this station at the Humber mouth is taken as one of the many signs which have recently been brought to light of the greater importance attached to the river by the naval authorities. The suggestion is that with the completion of the dock works at Grimsby—the greatest deep-water on the East Coast—a naval base will be established there. From the wireless stations at Humberstone, five miles from Grimsby, H.M. ships can be communicated with in the North Sea, the Channel, off the West of Ireland, and beyond the Scottish coast in the North Atlantic.

INSTITUTE OF MARINE ENGINEERS.

THE twentieth annual meeting was held at the premises of the Institute of Marine Engineers on March 19th, James Denny, Esq., president, in the chair.

The Chairman formally opened the meeting and scrutineers were appointed to examine the ballot papers and declare the result of the votes of the members for the election of office bearers and Council.

The Hon. Secretary was then called upon to read the annual report:—

In presenting the twentieth annual report of the Institute of Marine Engineers to the members, it seems fitting that a few prefatory comments should be made on the progress which has been witnessed since the Institute was founded and proceedings opened by the establishment of a small reading-room on February 1st, 1889, in the Langthorne Rooms, Stratford. The preliminary work of arranging and organizing was initiated in the autumn of 1888. A circular was framed and a large number of copies issued, calling a meeting of marine engineers interested in the aims and objects set forth as a basis for the proposed Institute. The attendance at the meeting was very discouraging, very few were present, and although it appeared to the majority of those who met to discuss the question that apathy rather than enthusiasm was the predominant feature in the situation, the minority was possessed with the important factor of enthusiasm and urged that a committee should be formed at once to go ahead and risk the following. It was so determined, and the justification was soon made manifest. The first sovereign subscribed was by a chief engineer—John Tait, now gone to his rest, who, at one of the Committee meetings, recognised that expenses had already been incurred and were being incurred, and it was necessary to form a fund. It is a pleasant reminiscence and an appropriate one that a sea-going marine engineer should be the one to lay down the first coin to establish an Institute for the advancement professionally of marine engineers. The Committee appointed their office bearers and set to work organizing, with the result that enthusiasm gathered, and the reading-room was opened; then followed the opening paper and discussion. The membership increased to an extent which justified the incorporation of the Institute in July, 1889. The work prospered, and confidence in its stability having been established, the Council looked around for freehold premises, obtained subscriptions, and after much searching and deliberation, the premises at 58, Romford Road, were purchased, and fitted up for the efficient carrying on of the operations. With these few words on the initiation of the Institute, we turn to the report of the year ending January 31st, 1909.

It is with extreme pleasure that the Council notes the increase in the activity and in the value of the work of the Institute during recent sessions, and especially during the past session. The attendances at the various meetings held in the home premises have been better than formerly; the papers and lectures given have been well worthy of the support they have received, some by reason of their great practical utility, others, on account of their suggestions as to application of new methods of motive power and power transmission, indicative of the advance in engineering science. Additional incentives to professional study have been offered to the various grades of the membership, and in each of the other branches of the Institute's operations, improvement and greater efficiency have prevailed. The increased number added to the membership roll during the year is another matter for congratulation, but a regrettable feature is the number of members whose names have had to be removed through non-payment of subscriptions. This has been due largely to members omitting to notify changes of address, and it is therefore urged that notification of such change, be duly sent as occasion requires.

The Council regrets to have to place on record loss of the following members by death, and takes this opportunity of again tendering sympathy to the bereaved relatives. James Black (member), elected in November, 1898; John Corry (past President); Wm. Davies (member), elected 1907; Engineer-Captain R. W. Edwards, R.N. (Vice-president), elected 1901; Edward Elliott (Vice-president), elected 1894; A. Gibb (member), elected 1889; G. A. Harris (member),

elected 1891; Harry Jeffries (member), joined 1907; John McLachlan (member), elected 1891; Kenneth McInnes (member), elected 1890; Wm. Ramsay (member), joined 1893; J. S. Rogers (associate), elected 1896; Captain A. R. Smith (Companion); Walkinshaw Stevenson (member), elected 1906.

The roll of membership to the end of January, 1909, was 1038, after deducting removals by death, retirement and lapsing, the nett additions during the year being 28.

The Presidential Address was delivered on October 5th, and Mr. Denny gave some of the results of his observations during his long experience in marine engineering.

A number of very interesting papers have been read and lectures delivered during the session.

Various fuel tests have been conducted under the convenership of Messrs. J. Clark and W. McLaren, the results being duly entered in the report book and copies of the report sent on to the members on whose behalf the tests were made, and to other members who have made application. On one evening a demonstration was given showing the analysis of flue gases by means of a CO_2 recorder, the boiler-house of the Municipal Technical Institute being very kindly placed at our disposal for the occasion by Mr. Duncan, head of the engineering department.

The work of this department has hitherto been confined to fuel testing, and the desire has been expressed that its scope should be widened in order to embrace facilities for conducting tests to ascertain the conductivities of insulating materials and other tests which would be of value to the members. It is hoped that financial assistance may be received during the coming session which will make it possible to carry this desire into effect.

Visits were made during the summer months to the West Ham Power Station, Messrs. Geo. Jennings, Ltd., Lambeth, the Franco-British Exhibition twice. On the first visit to the exhibition the members met in the Congress Hall in the evening, when Mr. W. P. Durtnall read his paper on "The electrical transmission of power for main marine propulsion," and on the second occasion Mr. J. T. Milton (member of Council) delivered a lecture on "The corrosion and decay of metals."

A course of visits for the coming summer months is being arranged for Saturday afternoon in April to September, and the announcements will be issued in due course.

The first International Congress of the refrigerating industries was held at Paris from October 5th to 12th, when the Institute was officially represented by the Hon. Secretary, and an International Congress in connection with the Association for Testing Materials is to be held at Copenhagen in September, 1909.

AWARDS.

Lloyd's Register Scholarships.—As a result of the generous offer of Mr. James Dixon, chairman of Lloyd's Register of Shipping, made at the annual dinner in October, 1907, the Council has pleasure in placing on record the establishment, under the auspices of the Institute, of two scholarships, to be known as the "Lloyd's Register Scholarships," each to the value of £50 per year, tenable for two years. The winner was Mr. James Richmond Thomson (Graduate), apprentice with Messrs. Wm. Beardmore & Co., Ltd., of Clydebank, who elected to enter Glasgow University, where he is now pursuing his studies.

The Denny Gold Medal was awarded to Mr. Robert Elliott, B.Sc. (Vice-president), of Greenock, for his paper on "Repairs to the hull of iron and steel ships and to machinery," read during session 1907-8. This medal is open for competition to the whole of the membership of all grades.

It has been decided to devote the interest on the Stephen legacy to the purchase of books or instruments to the value of £2 each to the Associate Member and the Associate who contribute the best papers on the following subjects, provided they be of sufficient merit:—Associate Member, "The turbine for marine work"; Associate, "Feed heating," with descriptions of any types which have been seen by the writer.

By the kindness of Mr. A. Ritchie (member), of Hong-Kong, books or instruments to the value af £2 will also be awarded to the graduate of the Institute who sends in the best paper on "The functions of air and circulating pumps," with descriptions of any types which have been seen by the writer.

The annual dinner was held at the Holborn Restaurant on October 28th. The official report of the dinner has already been issued.

The conversazione and ball, which was held in the Holborn Restaurant on December 11th, was very successful, a pleasing feature being the attendance of the president and Mrs. Denny, who held a reception immediately after the concert and before the commencement of the ball.

The five Bohemian concerts held at the Institute on the invitation of Mr. A. E. Battle, Mr. F. Cooper, R.N.R., and others, Messrs. W. Lawrie and John Weir, I.M.E. Tennis Club, Messrs. J. Adamson and W. E. Farenden, were very enjoyable, as the large attendances at the concerts attested.

The Committee appointed by the Council to consider and report upon the subject of the proposed new premises for the Institute had before them the suggestions either to rent rooms in the city where members might meet during the day and in the evening, retaining the Institute at Stratford as the headquarters, or to dispose of the Institute building and purchase or build new premises. The undernoted premises have been personally inspected by one or more members of the Committee, and their suitability in regard to situation, accommodation and cost carefully considered.

Premises for sale near Charing Cross were considered to be fairly suitable, but a good deal of expense would have been necessitated to adapt them for the use of the Institute, added to which there was the responsibility of letting the portion which would not be required. The necessity for almost immediate tenancy was another feature which militated against these premises.

Some buildings were examined near Bishopsgate Street, but the situation and surroundings were not considered quite suitable, while the rental of £256 per annum, added to the other costs of adapting this building for the purposes of the Institute were prohibitive.

Various buildings in Fenchurch Street, the Minories and elsewhere were inspected and reported upon, but in each case the rents to cover the requirements were prohibitive, ranging from £40 to £110 per room, and in several cases the use of the premises for evening meetings was not allowed.

Negotiations were opened with a view to renting rooms in Bishopsgate Institute and the premises were examined and particulars obtained. Ultimately, after the Committee of this Institute had the matter under consideration, it was found that the spare rooms would probably be required by themselves in the near future and they were not disposed to let them.

Negotiations were opened with the London Institution whose wealth of property, of library, and opportunity for good are well known, but these were delayed pending the decision of the trustees and fellows of that Institution regarding the question of rebuilding on the present site, and considerations affecting the charter and other internal points. A tentative proposal was made, in which case they offered to provide suitable accommodation for the sum of £2000 per annum. This was thought too heavy an expense for the Institute to bear. Subsequently the Institution adopted another line of policy in connection with the rebuilding and adaptation of the proposed new building; negotiations were again opened and are now proceeding. Their most recent proposal, and which is likely to be carried into effect by the heritors, is to unite with the Society of Arts and erect a fine building to suit the purpose of their joint occupation at Kingsway.

Application was also made to see if an arrangement could be arrived at with the Institution of Electrical Engineers to rent or take over some of the rooms in the building on the Thames Embankment which the Institution is about to occupy. The Committee of that Institution are still considering the matter, but stated that as they did not enter into possession until June, a few months might elapse before they could make any arrangements to accommodate the Institute should they be disposed to lease any of the rooms.

After fully considering the various proposals, and with a full knowledge of the comparative values and advantages of situation, the Committee are of opinion that when the Institute makes a move it should be to the neighbourhood of Westminster, chiefly because of the prohibitive cost of ground rents and buildings within the boundary of the City of London, in addition to which the Westminster neighbourhood would probably be more convenient. They also consider that it

would be highly inadvisable to rent rooms, which would entail a heavy revenue expenditure annually, thus frittering away a large amount of money which might be saved or put aside and devoted to the purpose of ultimately acquiring premises. As a tentative scheme they therefore proposed that an effort should be made to raise the sum of £12,000, with the object of purchasing a building in the selected neighbourhood. If it were necessary part of the building could be mortgaged and the interest on the mortgage raised by sub-letting a portion of the proposed new premises.

Some months ago a circular was issued to every member of the Institute asking him to favour the Committee and Council with his views on this subject generally, but a very small number of replies was received, and it was a matter of disappointment and regret to the Committee and Council, after having devoted so much of their time to the subject, to find that only a very small minority of the members appeared to be interested in the proposed change, while the large majority seemed to regard the question as not of sufficient importance meantime to deliver an opinion upon the matter. A second circular was issued to the membership in the hope that further replies or a definite character would be received in time to incorporate with the annual report to be presented at the annual meeting of the members.

Mr. George Shearer, the representative of the Institute on the Advisory Committee of the Board of Trade, reports that among the many subjects which received consideration, the following more particularly interest marine engineers:—Manning of vessels; deck and stokehold. Suicides of firemen (Inquiry). Ventilation of engine rooms and stokeholds. Qualifications for a 2nd-class certificate of competency as engineer; as modified by the Board of Trade for the purposes of adaptation to vessels propelled by oil engines (for passenger coasting vessels only).

The Council in Committee considered these subjects in detail along with Mr. Shearer, with a view to rendering any assistance with regard to the several points involved. The two subjects last named were specially considered and have been brought before the members incidentally at the ordinary meetings for discussion in connection with papers bearing on these subjects. The questions affecting the introduction of gas and oil engines in coasting and other vessels are growing in importance, hence the necessity of marine engineers becoming familiar with the details and working conditions of these engines is manifest. The increase of the number of junior members of the Institute attending the meetings was an encouraging feature of the session. Proposals are now being made among the members of the Junior section to arrange meetings for that section exclusively, for the reading of papers and holding of discussions, also to arrange visits to works.

The Lawn Tennis Club has shown a good deal of activity during 1908-9, with a membership of twenty-eight. Two gold medals, kindly provided by Mr. John McLaren, were awarded at the close of the season to the players—one lady and one gentleman—most successful in scoring at the tournaments held in the course of the season.

The arrangement of issuing the Transactions monthly has met with the approval of the entire membership, and the attention of members is called to the desirability of keeping before them notes and records of experiences in connection with the working of machinery, which may serve as bases for papers or communications to be submitted for reading at the ordinary meetings of the Institute. The Council is indebted to those members who have presented works to the library of the Institute during the session, and it is hoped that works on the latest discoveries and practice in marine engineering will be forthcoming during the ensuing year. Members are also invited to contribute newspaper cuttings giving items of interest or records of extraordinary occurrences which they think worthy of preservation.

The Council considers it may be of interest to note that seventy-six members have acted upon the Council of the Institute since its foundation.

The Hon. Treasurer submitted the revenue account and balance sheet, the former showing a loss of £41 5s. 11d. at the end of the financial year, and the latter showing assets amounting to £3331 14s. 7d. The presentation of the accounts was accompanied by an explanation by the Hon. Treasurer as to the reasons governing the fall in the current account balance partly due to the heavy outlay on the Transactions of the Institute. The report of the chartered accountants was also read.

The Chairman, after commenting on the matters referred to in the annual report, moved the adoption of the report and accounts, which was seconded by Mr. R. Leslie, R.N.R. The motion was put and carried with applause.

Mr. W. T. Seaton (member) proposed a vote of thanks to the retiring president in very appreciative words. Mr. T. F. Aukland seconded the vote, and Mr. W. I. Taylor told of the great help Mr. Denny had given him as convener of the annual dinner. The motion was put and carried with prolonged cheers. The President suitably responded.

A vote of thanks to the office bearers and Council proposed by Mr. J. R. Ruthven and seconded by Mr. W. C. Roberts, R.N.R., was responded to by the Hon. Secretary, The hon. auditors, Messrs. J. Clark and A. Robertson, were re-elected on the motion of Mr. J. H. Redman, seconded by Mr. Milton. Some discussion having taken place with regard to City premises, a motion was put and carried *nem. con.* that the Committee that had been appointed by the Council be reappointed by the new Council, with power to add to their number, and that members outside the Council could be called in, and in addition to having power to look out for premises which they could rent, they have also power to bring a proposal before the members of the Institute for building or buying.

Messrs. F. M. Timpson and J. C. Anderson, the scrutineers, were then called upon to give the results of the voting papers, and announced that the following gentlemen had been elected office bearers and members of Council:—President, Mr. James Dixon; hon. treasurer, Mr. A. H. Mather; hon. secretary, Mr. James Adamson; hon. financial secretary, Mr. E. W. Ross; hon. minute secretary, Mr. J. G. Hawthorn; members of Council, Messrs. Geo. Adams, K. C. Bales, D. Hulme, J. H. Silley and W. I. Taylor. The members of Council not retiring were Messrs. A. E. Battle, P. T. Campbell, John Clark, J. E. Elmslie, J. Lang. R.N.R., J. M'Laren, J. T. Milton and J. F. Redman.

The proceedings closed with a vote of thanks to the chairman on the motion of Mr. J. E. Elmslie.

MARINE OIL ENGINES.

A Swedish Motor Vessel on Tour.

It seems to have fallen to the lot of a well-known Continental company to show British marine motor manufacturers how to encourage the adoption of the internal-combustion engine among the fishermen of Great Britain.

Having recently completed a successful exhibition tour on the Continent, the motor vessel *Bolinders VII.* has now arrived in this country for a tour on exhibition around the coasts of Great Britain and Ireland, to demonstrate to British users the very latest production in foreign marine oil engines. The vessel was built by the famous firm of Messrs. J. & C. G. Bolinders Co., Ltd., of Stockholm, Sweden, and is fitted with a 60 h.p. Bolinders direct reversible oil engine. By means of this direct reverser, the engine itself is caused to rotate in the one or the other direction, whereby the bulk and weight of the machinery is considerably diminished. In this case the engine is manœuvred by means of a lever, and with these devices its speed can be moderated within very wide limits. When running, only crude oil is used, and on a consumption of this *Bolinders VII.* attains an average speed of nine knots per hour. When she came over to England, at the beginning of April, her passage from Hamburg to Hull—quay to quay—only took 44 hours. She has a second motor of 10 h.p. for driving the winch, and a third and still smaller one of 1 h.p. for the purpose of compressing the air used in starting the two large motors. This smallest motor, however, is not an essential factor.

The engines manufactured by The Bolinders Company are suitable for pleasure launches, fishing boats, tug boats, and for all manner of coasters and vessels engaged in canal and river traffic. The engine is very simple and strong in construction, requires very little attention, and can be operated by any

intelligent sailor or fisherman. In addition to the direct reverser it is made with two other different kinds of reversing devices. The propeller-reversing apparatus is manipulated by means of a lever which causes the propeller shaft to rotate in the one or the other direction, while the engine always runs in the same direction. When the propeller is to be stopped, the lever is placed in an intermediate position, whereby the propeller shaft is thrown out of gear and the engine runs without transmitting any power to the shaft. In the case of the reversible propeller blades device, however, the reversing is accomplished by means of a hand wheel, and it is also possible to regulate the speed both forward and back without actually altering the speed of the engine.

During her tour, which her skipper, Captain Ossian Lindblom, says will probably last to the end of the present year, *Bolinders VII.* will make a call of a few days at every harbour of any importance, and those interested should avail themselves of this opportunity of going on board and testing the usefulness and stability of this latest foreign motor engine.

During her stay recently at Hull, Grimsby, Yarmouth and Lowestoft, a large number of experts visited the vessel, and have been most favourably impressed with the working of the motor and its suitability for purposes of marine propulsion. *Bolinders VII.*, being built as a fishing vessel, her engines were not constructed for speed, but it is stated that the Bolinders Company will, early this month (May), send out a motor launch specially constructed with a view of attaining a very high rate of speed. It will first visit Hamburg, Bremen, Rotterdam, Antwerp and several other Continental ports, but the Swedish company evidently desires to particularly conquer new fields in this country, and the launch will shortly

Bolinders VII

arrive here for a specially extended exhibition tour round the British Isles.

It is announced that several prominent English firms are about to follow suit and to despatch fishing vessels round the East Coast and Scottish ports. If a craft of the *Bolinders VII.* description had been despatched on a demonstration tour twelve months ago, by any of our leading firms, there is not the slightest doubt that that particular firm would practically have the monopoly for the sale of marine motors suitable for fishing boats, as fishermen on the east coast of England and Scotland were only waiting for the working results of a large motor vessel to remove their prejudice against modern power craft.

Motor Boats.—Board of Trade surveys. In view of the increasing use of oil engines for the propulsion of passenger vessels, the Board of Trade has recently issued instructions for the information and guidance of its officers in surveying motor boats, for which a passenger certificate is required.

MONACO MOTOR BOAT RACES.

The launch *Gyrinus II.* has, as was anticipated, carried off the "Prix de la Mediteranee" at the Monaco Motor Boat meeting on April 6th, this being the first of the races in which she was entered.

The boat is practically a repeat of the *Gyrinus I.*, which was specially built for the Olympia races of the 8 m. cruiser class, and was successful in the two

Gyrinus II

events. She proved the fastest boat and made world's records for her class.

The new boat has a rather more powerful motor, and has, on her first trial runs, exceeded 22 knots an hour.

She was built by John I. Thornycroft & Co., Ltd.

Motor Boat Regulations.—The United States Department of Commerce and Labour has issued regulations concerning the equipment of motor boats as to licences, life belts lights and whistles.

The annual International Exhibition at Monaco was opened on the 31st March, and was visited by many distinguished people interested in motor boating. The racing commenced on April 4th and continued until April 10th. The entries were almost twice as many as in 1908. The Wolseley-Siddeley II. won the "Prize of Monte Carlo," and Gyrinus II., as stated elsewhere, carried off the "Prix de la Medeteranee." On April 9th the Wolseley-Siddeley II. won the "Grand Prix International."

British Motor Boat Club.—It has been decided to alter the date of the Erith Meeting to June 19th. The fixture list is as follows:—May 29th and 31st, Lowestoft Meeting; June 1st, Oulton Broad Meeting; June 12th, Thames Race; June 19th, Erith Meeting; July 9th, 10th and 12th, Ramsgate Meeting; July 31st, London to Cowes Race; August 2nd, Cowes Meeting; August 6th, Royal Cowes Town Regatta; August 7th, Race round the Isle of Wight; September 9th, 10th, 11th, Burnham Meeting (these dates will probably be altered to September 16th, 17th and 18th.)

THE "SONIA," a handsome new river motor launch, has been completed to the order of Mr. Percy Wright by Mr. A. J. Witty, of Nottingham, to the designs of Mr. James A. Smith, M.I.N.A. Her dimensions are 26 ft. by 5 ft., and the motor is a 12-h.p. Wolseley. The hull is of mahogany, with straight stem, slipper stern, and very ample seating accommodation. The model is a very pretty one, and Mr. Witty, who has produced a boat equal to anything turned out on the Thames, has a second launch in hand to the same design.

BOILER-ROOM EQUIPMENT.

IV.

The corrosion of all metallic surfaces about a ship and its engines must of necessity occupy a large share of the attention of those responsible for the efficient maintenance of the structures, and the demand for inspection is nowhere greater than in the stokehold, for in and about the boilers there are concentrated all the requirements suited to rapid decay, nor is minute examination placed under too favourable conditions. The tanks below the boilers offer adequate means for the production of corrosion, the ship's skin at a low temperature, the tank top at a moderately high temperature, and the presence of salt water or moist air give all the elements necessary for galvanic action. The practice of keeping these tanks dry is advantageous, although there must always be some moisture present. Bitumastic or cement coverings afford protection to the plate, covering the boiler bottoms with asbestos mattresses reduces the temperature, and discouraging the too lavish use of the "big tank" for cooling ashes all tend to reduce the liability of wastage, which is so apt to occur when protective measure are neglected.

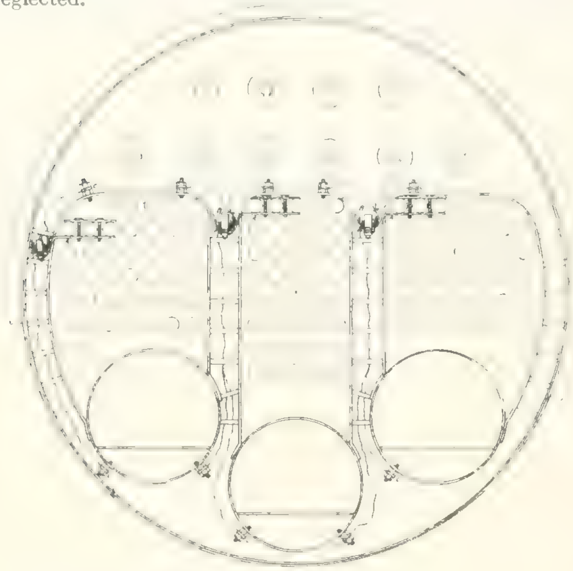


Fig. 1.

With regard to the internal surfaces of the boiler, there are still greater tendencies for electrolytic action to be produced, and by faulty circulation temperature differences occur which, with the ever-present acid or saline state of the water, convert the boiler into a species of voltaic cell. To prevent decomposition of the plates an electrode of some substance is used, this generally taking the form of zinc slabs, either cast or rolled, which are pinned to the chamber plates and furnace bottoms or attached to the stays with a good metallic contact. These zinc plates are in a similar condition to the negative pole of the primary cell, and a current being generated flows from the positive steel plate into the zinc by the metallic joint, and thence back to the steel plate through the water, carrying with it the zinc iron, by which process the slab is in time disintegrated and requires renewal. Besides the decomposing action of the main current, local action is continually taking place, due to impurities in the zinc, these consisting principally of particles of iron which form minute cells with adjacent zinc particles, and thus waste away the slab and reduce its protective qualities. The remedy for this is amalgamation, the slab being dipped in sulphuric acid to clean the surface and then into mercury, thus largely reducing internal wastage without greatly reducing its conducting power.

ELECTROGENS, GLASGOW PATENTS CO., KINNING PARK, GLASGOW.—This apparatus has for its object the protection of the boiler from corrosion on the same principle as that of the zinc plates but in a more scientific manner. As seen from the illustration (Fig. 1), gun metal studs are screwed into the furnace sides and combustion chamber tops, from which leads are taken to the electrogen balls placed in the spaces between the top rows of tubes. The wires are securely fixed in electrical contact with the copper rods forming the central core of the ball. The copper rod has cast round it a mass of virgin spelter, so that metallic contact is assured, and the galvanic current, flowing from the boiler plate along the wires, passes into the zinc and thence into the boiler water, which acts as an electrolyte. The action in order to be efficiently maintained requires a slightly saline solution of a density of from one to two ounces, and clean metallic contacts are, of course, a prime necessity. The average life of these electrogens is about six months, thus assuring a greater efficiency than with zinc slabs, and enabling renewals to be regularly maintained in the home port in most instances.

It is further claimed for the electrogen that the generation of the current electrolyses the water, forming bubbles of gas on the boiler plate which tend to prevent the deposition of scale. A series of experiments have recently been conducted which appear to bear out this hypothesis; a number of cells of the simple 2-volt type were connected to the boiler so that a current passed from the water into the boiler plate, the latter being the cathode pole, bubbles of hydrogen were evolved on the surface, and such scale as would have formed was found precipitated as mud at the boiler bottom. As the chemical effect is dependent on the current the cells are joined in parallel and so far low voltage only has been tried.

JUNIOR ENGINEERS.

WITH the exception of some special types of planing machines, and those operated by separate variable speed motors, the general run of these tools are driven at one constant cutting speed for all materials and cut, which is independent of the length of stroke. In order that the full duty of the machine can be obtained some modification of this is necessary, and, where the amount of planing work is considerable, the line of planers laid down is arranged so that the driving pulleys on the shafting give a speed to each machine graduated according as that machine is specialized upon steel, iron or brass. Where, however, the number of machines installed does not warrant this, or it may be they are so scattered through the shop by the requirements of space or the original lay out of the plant, and this system proves impracticable, the substitute generally adopted is to drive through a pair of cone pulleys off the main shafting, these being graded as near as possible to suit the speeds required by the different materials operated upon.

In the case of the shaper and slotter these machines are supplied with cone pulleys, and frequently with back gear, so that a range of speeds is obtainable; besides this, the alteration in stroke effects a difference in cutting speed, as for any given speed of the cone pulley the number of working strokes is that of the number of revolutions, and if the stroke be lengthened the cutting speed is increased to give the longer travel in the same period of time, and *vice versa* if the stroke be made shorter. Although any surplus in length of stroke, over that which is actually required, is waste time on the planer, it is of less moment on these other two types of machines, except as tending to increase the shock on reversal due to the accelerating of the tool running without a load.

The speeds for these machines are most conveniently found by noting the time in seconds of any length of cut, and the full lines on the speedgraph shown give suitable rates for roughing cuts on the different metals, the finishing cut being usually performed on the next slowest step of the cone pulley. The dotted lines correspond to the speeds given by the four steps on the cone, these of course depending on the machine, and if back gear is fitted will be increased to a range of eight speeds; by setting out the driving speeds thus a ready method is obtained for ascertaining the step and gearing required for a particular length of cut. For instance, with the 10-in. cut on gun metal the time period will be two seconds, and the speed required is obtained from the second step on the cone, with a length of stroke adjusted to $11\frac{1}{2}$ in., giving $1\frac{1}{2}$ in. more or less of clearance travel.

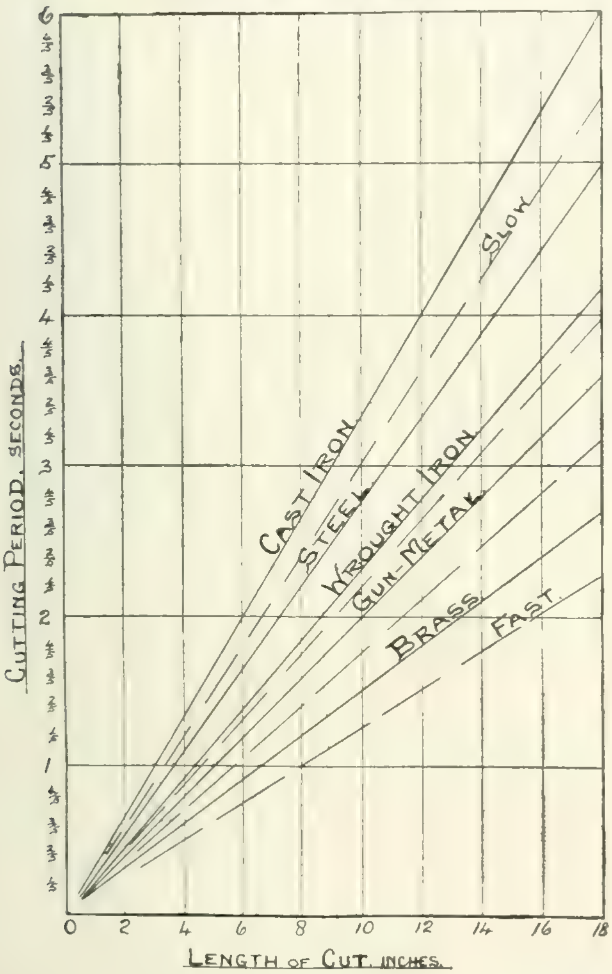
For planing machines these speeds may be increased by 10 per cent. with moderate strokes, as the pressure on the tool is more uniform, but if the speed is constant for both roughing and finishing cuts, some consideration must be given to the speed arrangements where a fine finish is required. For the purpose of timing longer cuts than shown, the lengths

and times may be multiplied by 10, thus a cast-iron cut of 60 in. will take twenty seconds, or for a 10 per cent. increase multiply the time by 9, giving eighteen seconds.

The deep cut and moderately fine feed are most productive for roughing purposes, up to $\frac{3}{4}$ in. depth on the planer with a

SLOTTING & SHAPING.

CUTTING SPEEDS. INCHES PER SECOND.



traverse of $\frac{1}{16}$ to $\frac{1}{8}$ in. per stroke for cast iron, and $\frac{1}{2}$ in. deep for steel. The slotter and shaper are in general lighter powered and take rather less than this, as will of course very small planers, the cut being more often than not limited by the ability of the belt to stay on the pulley, this resistance to the drive being noticeable on the planer by the shrieking of the belt in slipping on its pulley, a feature to be avoided as causing both a loss in power and wear on the belt, although this is frequently occurrent at the reversing of the stroke when changing over the belt.

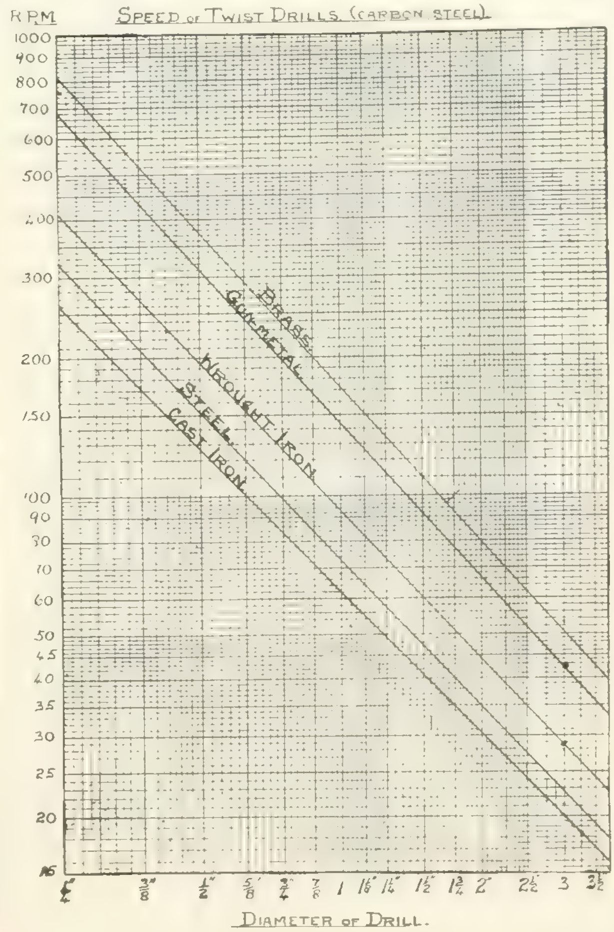
For finishing cuts a broad, flat tool is used, with front rake only, and taking a minimum thickness of shaving with as coarse a feed as is consistent with tooling the whole surface and removing the roughing marks, the speed being, as before stated, rather slower where possible.

The second set of curves shows the suitable speeds for twist drills, plotted on a logarithmic scale for simplicity, the dominating factor being that the peripheral speed of the drill must be kept within the limits imposed by the tendency to heating and dulling of the lips or the outer edges, and the maintaining of a clean hole. This peripheral speed will be increased gradually from the larger sizes down to about $\frac{1}{4}$ in. diameter, but for drills smaller than this the speed is considerably increased, as besides the fact that the ratio of circumference of drill to metal removed gives a larger cooling surface to the small drill in comparison with the large size, the very small tools cannot be fed so fast or breakage will result, and generally the drills below $\frac{1}{4}$ in. diameter are operated in a sensitive machine in which the pressure on the drill can be felt by the operator, and the regulation is under complete control by hand.

The speeds adopted by different makers vary considerably, but those given are in line with general practice for most operations. The available speeds on the one machine frequently preclude the entire range being covered, that is from drilling brass with small holes to steel with the largest sizes, and this is met by running either separate machines for different materials or for ranges of diameters of drills, the latter being the most usual and practicable. The range of speeds of any one machine is restricted by the gearing, and these, being constant quantities, can be tabulated against their respective revolutions per minute. The feeding of the drill is in general operated from the spindle drive, either by gearing or belting, and has relatively to the speed of the drill seldom more than three or four changes, so that the feed rates are most conveniently expressed as revolutions per inch, and vary from 80 to 120, the coarse rate being for brass and large drills, the fine for cast iron and small drills.

For the common type of flat drill these speeds are higher than can be efficiently maintained, and 25 to 30 per cent. lower rates may be adopted. The feeds also would be too coarse for the point of the drill to stand the pressure without dulling or fracturing, and the temper of these tools, not being usually brought to so high a standard as with the manufactured twist drill, is more easily drawn if the temperature becomes high.

SPEED OF TWIST DRILLS. (CARBON STEEL).



The lubrication of the drill is important if the best speeds are to be attained, that is for steel and wrought iron, although a tough gun metal which produces a shaving is also assisted by lubrication; cast iron and brass are, however, run dry, the chief impediment here being the clogging effect which the small particles of the metal have on the drill by being ground against one another, and injuring the cutting edges, so that the best "lubricant" is an air jet blown into the hole, or, what is often seen done, the scooping of the cuttings out of the hole by means of a short flattened rod.

Industrial and Trade Notes.

THE CLYDE AND SCOTLAND.

(From our Own Correspondent.)

First Quarter's Clyde Output.—Before referring to more recent work and contracts it may be recorded that the shipbuilding output on the Clyde during the first quarter of 1909, while below the average for the corresponding period during the past decade, was yet considerably in advance of the output for the first quarter of last year. Altogether, in round, but sufficiently accurate figures, thirty vessels of 71,000 tons were consigned to the water as compared with sixty-five vessels of 60,000 tons last year. The average size of the contributory items to the tonnage for the two corresponding periods differs very strikingly. Last year the average tonnage of the vessels launched was 923 tons, whereas, for the first quarter this year the average was 2367 tons. While a number of high-class Orient and P. and O. liners swell the aggregate on this occasion, the disparity in average tonnage, generally speaking, is accounted for by reason of the increased number and size of large deadweight carrying steamers forming the major part of the shipping now being built. This is still a growing feature of the shipbuilding work on hand and being ordered. There has, in fact, been of late quite a boom in the placing of contracts for large steamers intended for general cargo carrying purposes. During the three months contracts for about 200,000 tons deadweight were intimated on the Clyde alone. Of these about 97,000 tons were placed in January and February, and about 103,000 in March. The "lion's share" of this new business went to the Port Glasgow and Greenock districts—one firm alone, Messrs. Russell & Co., having secured six steamers of over 64,000 tons.

New Shipbuilding Orders.—Since last month's notes were penned, not a few fresh orders for steamers, mostly for general carrying purposes, have been secured by Clyde builders, but notwithstanding this, shipyards on the river, in many instances, present "a beggarly array of bare poles!" The most important items contracted for may be briefly enumerated. Messrs. Russell & Co., Port Glasgow, towards the end of March received orders from Messrs. Andrew Weir and Co., Glasgow and London, for four large vessels representing fairly high-class work. Two of these are passenger and cargo vessels of 11,000 tons carrying capacity each, and two are of 8000 tons. The engines for these four vessels, which will have an aggregate I.H.P. of 12,000, will be supplied by Messrs. Rankin & Blackmore, of Greenock. The same firm, Messrs. Russell & Co., have received an order from Messrs. Robert McKill & Co., Glasgow, for a steamer of 7300 tons capacity for which engines will be supplied by Messrs. David Rowan & Co., Glasgow. Messrs. D. & W. Henderson and Co., Partick, have received from Messrs. Bell Bros. and McLelland, shipowners, Glasgow, an order for a first-class cargo steamer of about 7000 tons. Messrs. George Brown and Co., Greenock, have contracted to build a passenger steamer 130 ft. in length, for service in the South of Ireland. A Glasgow firm will supply the engines. The contract between the Clyde Shipping Co. and Scott's Shipbuilding and Engineering Co., Greenock, for one steamer of 7700 tons, mentioned in last month's notes, is really for two steamers of 7000 tons each. They will be 400 ft. in length, and the builders will supply triple-expansion engines. Both vessels will be fitted with the best and most modern appliances for handling cargo. A contract for three first-class steamers of large size to be employed in the general cargo carrying trade has been booked by Messrs. William Hamilton & Co., Ltd., Port Glasgow, the owners being a Continental firm. The vessels, it is understood, will each be 300 ft. in length, and of about 6000 tons gross measurement, and will be constructed on the "Isherwood" system of longitudinal framing, for which Messrs. Hamilton & Co. are exclusive licensees in the Clyde district. Messrs. Ferguson Brothers, Port Glasgow, have received an order to build and engine a twin-screw floating crane vessel for service in India. When completed the vessel will be taken to pieces and forwarded to her destination in sections. The Greenock and Grangemouth Dockyard Co., Ltd., Greenock, have received an order from Messrs. Paton & Hendry, Glasgow, for a first-class passenger and cargo steamer for Australian owners. The engines and boilers are to be constructed by Messrs. Dunsmuir and Jackson, Ltd., Govan. Messrs. The Ailsa Shipbuilding Co., Troon, have secured the contract to build a steamer of 240 ft. length for the general trade of the General Steam Navigation Co., London. The workmen employed by the Ailsa Co. at their Ayr shipyard have lately memorialized the Town Council of Ayr about bringing pressure to bear upon the company to have a larger share of work done at Ayr. Troon apparently runs off with the lion's share at present.

Naval Work and Prospects.—The great "Dreadnought" scare, about which everybody seems to have heard—or been influenced by—except those who really *do* know the true inwardness of—has not upset the equanimity of Clyde managers of those establishments in which—when other circumstances permit, or imperatively demand—naval construction can proceed like clock-work. It has not as yet touched the quick of the brain, brawn and muscle of Clydeside industry. Talk is being tolerated, and patience is, of course, the quality still in demand. In these circumstances it is negatively comforting to the "pride of place" to learn that "an agreement has been concluded between the administration of the Baltic and Admiralty shipyards of the Imperial Russian Marine Ministry and Messrs. John Brown & Co., Ltd., of Clydebank and Sheffield, whereby the technical advice and co-operation of the company in questions connected with warship design and construction is secured for a term of years."

Destroyer Trials.—Having completed a series of trials on the Clyde, the torpedo-boat destroyer *Saracen* left Greenock on March 30th, for Cowes, where she was built. She is designed for a speed of 33 knots, and, like the *Swift*, which recently underwent important tests on the Clyde, she uses oil fuel. In the course of several spins over the measured mile, the *Saracen* steamed one knot over the guarantee figure, while in a lengthy cruise on the Firth, a mean speed of 32·2 knots was attained. The 36-knot destroyer *Swift* is still berthed in the James Watt Dock. It is understood that she will again be placed in dry dock before she leaves the Clyde with a view to further alteration of her propellers.

Work on East Coast of Scotland.—The John Duthie Torry Shipbuilding Co., Aberdeen, have recently built to the order of Messrs. Leiper Brothers, Torry, Aberdeen, a steam drifter, length 110 ft., breadth 20 ft., depth 12 ft. The vessel was named *Kingorth*. She is being fitted with triple-expansion engines by Messrs. Abernethy & Co., Aberdeen. Messrs. J. & G. Forbes, Fraserburgh, are building a motor fishing boat to the order of Messrs. George Walker & Sons, fish salesmen, Fraserburgh. The craft is the first of the kind constructed in the Fraserburgh district. It will measure 68 ft. of keel, and is to be fitted with a 75-H.P. Gardner motor engine. The speed will be 10 knots per hour. The shipbuilding yard of Messrs. Scott, of Kinghorn (Ltd.), —from which a steel screw transport steamer of 255 ft. keel for the Royal Spanish Navy was launched early in April—is at present idle, not one vessel being in the course of construction. Several workmen are engaged carrying out repairs on the sheds and otherwise clearing up, and it is expected that everything will be closed about the end of this month. Between 400 and 500 men have been empolyed of late in the yard.

Motors for Fishing Boats.—Many of the Moray Firth fishermen, who have found themselves unable—owing chiefly to the want of capital—to purchase the expensive steam drifter class of fishing vessel, are now turning their attention to the fitting up, etc., of their existing "Zulu" sail boats of the first-class with auxiliary motors. These sail boats, the construction of which came to an abrupt stop with the advent of the steam drifter boom several years ago, cost about £700, but there are now many of them in the market at from £250 to £350. The torpedo-boat firm of Messrs. J. Thornycroft & Co., having directed their attention tc this field of enterprise, devised special motors to meet the needs of the fishermen, and have recently achieved successful trials with their first installation on the Portknockie boat *Sardius*. The screw propeller is a two-bladed one to enable it to be set parallel with the sternpost when the boat is merely under sail. From the 80-H.P. motor alone, the *Sardius* has given a speed of rather over 8 knots an hour on a consumption of three gallons of paraffin oil. Petrol can be used if desired.

The motor, which occupies very small space, is fitted into the cabin floor, and can easily be worked by one of the fishermen comprising the crew. Magneto ignition is employed, and high tension has been adopted as offering fewer complications. The *Sardius* is also fitted with a capstan driven by compressed air supplied by the motor, which dispenses with a separate steam boiler for this purpose. Messrs. Thornycroft are also engaged in fitting motor installations into other two Banffshire fishing boats. Owing to the great difference in cost of maintenance and working, it is probable that with the further perfection of the motor for fishing boat purposes, the near future will see a development which will take the form of the replacement of the steam drifter's boiler and engine by motor power.

Transfers in Management.—The Clyde has recently lost the services of Mr. James G. Gowans, who has for eight years past been general manager of the London and Glasgow Engineering and Shipbuilding Co., Ltd., Govan. After Easter he took up his new duties as general manager of Palmer's Shipbuilding and Engineering Works at Jarrow-on-Tyne. Mr. Gowans left Messrs. Reid & Co., of Whiteinch, in March, 1890, to take up the position of yard manager at Sir W. G. Armstrong, Whitworth & Co.'s yard at Walker. He left there in August, 1891, to act as head shipyard manager at the Works of the Naval Construction and Armaments Co. at Barrow-in-Furness, where he remained for nine years. Shortly afterwards he was appointed general manager to the London and Glasgow Engineering and Shipbuilding Co., Ltd., Govan, which position, as already stated, he has held for the past eight years.

THE TYNE.

(*From our Own Correspondent.*)

The Shipbuilding Outlook.—It cannot be said that much change has taken place since last month, although having advanced so much further into the year, there ought to be some symptoms of improvement revealing themselves if the prophecies of certain optimistic writers are to be fulfilled. It is a matter for deep concern that there is as yet nothing cheerful to report in the outlook, as much distress continues to exist amongst the working population, and there is no real remedy for this state of matters excepting an accession of orders. A local paper of recent date has a paragraph on the subject of shipbuilding which states that "few orders have been booked lately; but that some *may* be placed by and bye." Now this is not very illuminating, and it is certain that if the writer had any real knowledge of the situation he would have expressed his views in more specific terms. The truth is that there is no movement in shipbuilding—everywhere stagnation is shown and the problem now to be faced is—how to put life into the industry. Under existing circumstances there is only one way of attracting orders, and that is by offering lowered quotations. Prices, however, must, as heretofore, be governed by the costs of labour and material, and in estimating for new work those concerned must take care not to go below the point which indicates the possibility of loss resulting, instead of profit. When prices are cut very fine, this element of doubt must be always present, and it is probable that in many recent transactions the shipbuilding employer who has secured a contract has, in doing so, unintentionally involved himself in some amount of difficulty.

The Shipyards.—Messrs. Armstrong, Whitworth & Co.'s Elswick yard is really the only one on the Tyne that is showing any approach to briskness, and it is fortunate that there is enough work in hand at that establishment to keep the present staff of employes fully engaged for some months to come. At the company's Low Walker yard most of the berths are still vacant, but a commencement has been made with the important work of preparing for fitting out purposes the newly acquired site in the immediate vicinity (formerly used for timber preserving) and a good many men have been provided with employment in connection with this enterprise. Messrs. Wood, Skinner & Co., though not quite so busy as at this time last year, have a fair amount of work in hand, and a very large proportion of the hands are kept in regular work. Messrs. Wm. Dobson & Co. are, after a long idle spell, again preparing to put down a vessel, and it is reported that further work may be forthcoming shortly. The Wallsend yards are not showing evidences of increasing business, and the yards at Hebburn have, unfortunately, to be referred to in similar terms. The graving docks, however, are kept in pretty regular employment, the facilities for docking and undocking vessels, as well as for carrying out general repairs, being of the best. At Jarrow, although slackness still prevails, the outlook has assumed a more cheerful aspect, it being felt that under the new management extra exertions will be made to bring orders to the Palmer Co.'s docks and shipyard. In the steel works and at the blast furnaces belonging to the company work is fairly brisk; but so far as the state of work is concerned the engine shops must come under the same category as the shipbuilding department.

Ship repairing establishments at Shields are just now fairly well off for work, and most of the graving docks and pontoons are occupied. Engineering works in this part of the district are mostly slack; but in one or two instances a temporary briskness is to be noted owing to the acquisition of some special work. The corrugated packing works of Messrs. Newton & Nicholson continue, notwithstanding the widespread depression in engineering, to be kept busy, this satisfactory state of affairs being no doubt attributable to the high appreciation of the packing among engineers.

THE WEAR.

(*From our Own Correspondent.*)

The Deptford Yard.—A scheme of arrangement for the resuscitation of business at the Deptford shipyard, which has been closed for several months, has just been issued, and will be placed before the persons interested at meetings to be held on an early date. An ordinary general meeting of the company is to be held for the appointment as directors of the three gentlemen whose names are annexed—Messrs. James H. H. Clark, James Marr, and Hugh Laing. The business of the yard is to be resumed as soon as possible, and expectations are entertained that once the meetings arranged for have been held, the starting of the yard will not be long delayed.

During the past few weeks Messrs. Austin have been exceptionally busy with repair work. Among the contracts dealt with was the overhauling of the s.s. *Clydesdale*, a locally owned vessel nearly 400 feet in length, which has had portions of both shell and deck plating renewed. This contract was carried out on the pontoon, which affords special facilities for the carrying out of repair work on vessels of a large class. The firm's graving dock has also been regularly occupied during the time, and vessels have received attention at the quay and at various mooring places on the river.

Messrs. Short Bros. have been repairing at their yard a foreign vessel that had been damaged by fire. This was the s.s. *Flandria*, belonging to Messrs. Nolson & Co., of Ghent, for whom the firm have built a number of vessels, including the s.s. *Brugia*, launched in February last. Some thirty deck plates had to be renewed and a number of others had to be removed for straightening and replaced in position. A number of beams had also to be removed and replaced by new ones, and in carrying out these alterations a good many operatives, including platers, rivetters, and caulkers were provided with employment. We understand that the firm are engaged in putting down a powerful pneumatic plant for the more effective carrying out of rivetting and caulking work. The firm have a considerable amount of new work in hand, and are as a matter of fact one of the three firms on the river that can be described as busy. The other firms that may come under this description are Messrs. Crown and Messrs. Robert Thompson & Sons. Both these firms have repair work as well as new work in hand, and for a considerable time past have had very marked success in obtaining contracts. At the South Dock Messrs. Bartram & Son have just placed the keel for a vessel of large size, but there does not appear to be much urgency for delivery in this case, as work proceeds but slowly. Messrs. Blumer are doing very little, and the condition of affairs at the North Sands yard has not improved. The last vessel on the stocks was launched from this yard early in the month, and there is as yet no sign of anything to succeed it. At one or two local yards the clerical staffs have been paid off, and this is regarded as one of the strongest proofs of continued depression that could be adduced. In

some quarters, however, hopes are expressed that a revival of trade will be experienced during the present year, and small as is the foundation upon which these hopes are based, every one will wish that they may be verified.

Engineering.—There have been some repair contracts at the Palmers' Hill Works this month, which have served to keep a fair proportion of the hands employed. The improved state of business at the North-Eastern Marine Works has been maintained, but at other establishments no new developments have become noticeable. In foundry work there is no improvement, and forges are, if anything, worse off for work than at any time previously.

Messrs. Richardson, Westgarth & Co., of the Scotia Engine Works, have in hand at the Quay a repair contract on a steamer of large size, and in the fitting and erecting shops there is still a considerable amount of work.

THE TEES AND HARTLEPOOLS.

(*From our Own Correspondent.*)

Middlesbrough.—Trade at this port is about the same as last month. It is rumoured that Messrs. Raylton Dixon have secured a contract to build two twin-screw steamers for the River Plate trade for a new firm, the engines to be built by Messrs. G. Clark & Sons, of Southwick, Sunderland. Messrs. Richardson, Westgarth & Co. are reported to have secured two contracts for land engines which will keep them going, but I understand the castings will come from the Hartlepool works of the same firm.

Stockton and Thornaby.—Trade is still very quite here, though it is reported one or two orders have been booked ; nothing definite can be learned as to who are their owners.

West Hartlepool.—Work here is somewhat the same as last month. Messrs. W. Gray & Co. have a very large boat undergoing very extensive repair, the pay during Easter week being reported as the largest at the old yard for any week this year, the new yard being only fairly well employed—also at the Central Marine Engine Works of this firm orders still remain scarce. At the dockyard shipyard of Messrs. Irvine's Shipbuilding and Dry Dock Co. work keeps fairly busy, all stocks being filled, the second boat for Messrs. Elder, Dempster & Co., Liverpool, being now fairly well on the way, the dry dock being kept fully employed with repair work, as they nearly always have a steamer waiting its turn.

Hartlepool.—Messrs. R. Jobson & Sons have bought the steamship *Garth*, and are having new boilers fitted to her ; they are reported to have bought the disused repair shop of Messrs. Richardson, Westgarth & Co. at Birt's Quay, which will be a great acquisition to this enterprising firm.

Messrs. Irvine's Shipbuilding and Dry Dock Company, Middleton Yard (late Furnss, Withy & Co.), is kept fairly well employed ; they are reported to have secured the contract to build a third steamer for Messrs. Elder, Dempster and Co., Liverpool. I understand this boat will be built at the Middleton Yard of this firm ; the other two are now building at the Dockyard Shipyard. The dry dock at this yard is being kept busy with repair work. They are also effecting extensive repairs to the boilers of the s.s. *Ohio*, belonging to Messrs. Furness, Withy & Co., fitting nine new furnaces and front end plates

Messrs. Richardson, Westgarth & Co. are kept fairly busy, having about six sets of engines on the way ; they are are also reported to have secured the contract for the engines and boilers for the third boat for Messrs. Elder, Dempster to be built by Messrs. Irvine's Dry Dock Co. This firm is also building what is reported to be the largest land turbine plant yet built in this country, and may be said to be fairly busy in this department ; they have also a fair amount of contracts for "Contraflo" condensers, for which this firm has become justly famous, likewise their various specialities. The aspect of trade generally is brighter, gradually the idle steamers have been taken from their moorings till only one or two remain, and no doubt managers anticipate a stiffening of freights to warrant running them. Enquiries are mostly for special boats suitable only for certain requirements, the ordinary cargo boat being very seldom asked for. The s.s. *Teessider*, of the Tyne and Tees Steamship Co., had a most successful run from the Tyne to the Thames, averaging nearly 14 knots over the entire run in full load trim. She is a graceful model and should be a great acquisition to her owners.

The co-partnery scheme may be said to be in full swing at the yards of Messrs. Irvine's Dry Dock Co., but the prominence given to this scheme by the press generally has resulted in workmen flocking here from all over the country, so that although a great number of men have been employed, the number on the books of the various trades societies are as great as ever. However, the joiners as yet may be said not to have had a fair start, so that in a few months we may expect trade to have picked up something like its normal condition.

The contract has been let for making new dock gates and a wider entrance to the West Hartlepool Docks of the North-Eastern Railway Co., which ought to be a great boon to the town, as the shipbuilders have been handicapped by the width and draught of entrance, to the size of steamer they could build. The Commissioners having agreed to keep the entrance clear of sand, for which purpose they are about to buy a large and suitable dredger specially for the purpose.

THE HUMBER AND DISTRICT.

(*From our Own Correspondent.*)

Admiralty Developments at Immingham.—The development of Grimsby for naval purposes is likely to proceed actively in the near future. For some time past there has been much talk of the probable establishment of a fleet base in the Humber, and it is now definitely stated that the Admiralty have decided to utilise the extensive docking resources of Great Grimsby and Immingham. Extensive preparations are being hurried forward, whereby, with the opening of this dock, which is the largest on the East Coast, Grimsby will not only be established as a coaling and victualling station for the Main Fleet, operating in the North Sea, but will also be utilised as the base for a flotilla of large and newly-built torpedo craft, which are shortly to be stationed at the mouth of the Humber. With this in view a line of moorings is to be laid down beyond Grimsby, out of the way of the general traffic of the Humber, and in such a manner as not to interfere with the fishing interests of the port. The coaling of ships at the new docks will be of the utmost importance, and in addition to the provision of a special huge coal hoist by the Humber Commercial Railway and Dock Company, the Admiralty will require a large tract of land adjacent to the docks for the erection of necessary buildings, wharves, etc. Negotiations for securing this land are already in progress, and altogether the general arrangements for establishing an East Coast naval base on the Humber are well in hand. The Immingham dock would undoubtedly provide Great Britain with a naval base of enormous value at the mouth of the North Sea, and would form a very useful connecting link in a long stretch of coast which is at present without any resources for the conduct of naval operations. The character of the land betwixt Hunstanton and Spurn Head is peculiarly adapted to torpedo tactics, and the idea is that Grimsby should form the point *d'appui* of a destroyer and submarine flotilla in the event of war.

Work of the Humber Conservancy Board.—At the annual meeting of the Humber Conservancy Board, which has been held at Hull, the annual report, which was adopted, reviewed the proceedings in connection with the dredging of the Hebble shoal. It is estimated that if the whole of the dredgings are deposited in the river the total expenditure will amount to over £39,000, of which about £23,000 will be borne by the Board and the remainder by the Hull Joint Dock Committee and the Hull & Barnsley Railway Company. In 1908 the sum of £6,000 was paid to the contractors on account. The reclamation of land at Broomfleet, referred to in the last annual report of the late Humber Conservancy Commissioners, was completed at a cost of £2,755, and tenders have been invited for tenancy of the land. The total enclosed area is about 322 acres, and there are about 120 acres outside the bank. Eight wrecks were removed from the Humber below Trent Falls. The revenue on conservancy account from all sources amounted to £33,027, or £4,847 in excess of the estimate, and the expenditure, estimated at about £27,900, actually amounted to £24,949. During the year 6,395 tons

of gravel were removed from the Binks under the supervision of the Board's engineer, and he and the conservator have since reported that such limited removal does not appear to have injuriously affected the Binks or Spurn Point.

Suggested New Use for Wireless Telegraphy.—A proposal on foot to control the supplies of fish to the markets by means of wireless telegraphy between the trawlers at sea and the land, and so make the supply and prices less variable, is being seriously discussed by the trawling companies and the heads of the fishing industry at Hull and Grimsby. "It would be an admirable thing if it could possibly be managed," says a prominent trawler owner, "but as the area of operations now extends from Iceland to Morocco, it is impossible to say what vessels will arrive on any given day. Wireless telegraphy could only be of practical use to fishing fleets that work near home in order to hurry them up to supply a scanty market."

Unique Floating Pontoon.—A huge floating pontoon, specially constructed to facilitate the loading of coal steamers, has been launched from the yard of the Goole Shipbuilding and Repairing Co., Ltd. The craft was built for the Aire and Calder Navigation Company, and is the only one of its kind in the world. It is to be fitted with a large hydraulic hoist for lifting canal barges which carry about forty tons. The pontoon is 115 ft. long and 46 ft. beam.

Hull Steamer Sold.—The steel ss. *Beeforth*, 2,659 tons gross, built and engined by Messrs. Palmers' Shipbuilding Company, Newcastle, in 1894, and owned by Messrs. Newton, Appleton and Co., Hull, at present lying at Cardiff, has been sold to Russian owners through Messrs. Jackson Bros. & Cory for about £10,000.

Whitby Harbour Improvements.—Good progress is being made with the improvement of Whitby harbour. The contractors are bringing large quantities of material for the extension of the quays, and the channel is being dredged so that there may be a depth of 7 ft. at low water on each side. The building of the harbour bridge is also being pushed on rapidly.

Increased Coaling Facilities at Hull.—Since the great coal boom of 1907, when the railway and dock authorities of Hull were suddenly called upon, with inadequate resources to deal with abnormal shipments of coal, the North-Eastern Railway Company have been gradually equipping their docks with coaling appliances of the very latest type, at a cost of many thousands of pounds, and when the existing contracts are completed their coaling capacity will be increased by from 1,000 to 1,200 tons per hour. There has been no hesitation in looking ahead, and in making liberal provision for future contingencies. Old and obsolete cranes and hoists have been removed to make room for modern appliances, which are marvels of engineering skill.

NORTH-WEST OF ENGLAND.

(*From our Own Correspondent.*)

Improved Prospects.—Since writing my notes last month the position has changed considerably. From a tantalising uncertainty it has changed to an assuring fact. I referred to the remarks of Mr. M'Kenna, which he made at the launch of the *Vanguard*, and wondered if there was any special significance in them or whether they were "soft soap." There was a special significance in them, as after events have proved. As a matter of fact, when he spoke he had in his mind the interviews that had taken place between the Admiralty and the armour and gun-mounting firms in this country, with respect to increasing the already extensive plants that are used in the production of gun-mountings. Practically work had been guaranteed to certain firms, of which Messrs. Vickers was one, if they would extend their works in the direction desired. At the present time the extensive gun-mounting departments at Barrow are only indifferently employed, but despite this fact, there is no doubt that in the early future there will be large extensions at Barrow, and from this it can be taken that we are here to be plentifully employed in our mounting departments. Then again there is the question of British "Dreadnought" building. Various are the forecasts regarding the number to be laid down this year, and at the moment it is impossible to say whether it will be four, six or eight. The question that is agitating this neighbourhood is whether Barrow will receive an order for one of them. It seems almost a certainty. The end of this month should see the Admiralty discussing the tenders, and three months after that will probably see the keels laid of some of them. That means about the end of July. In the meantime the *Vanguard*, fitting out here, will be well on towards completion. She will have her machinery on, and the big guns will be ready for hoisting. Thus the work on that vessel will in no way interfere with the construction of another. Neither will the Brazilian vessel interfere, for the armour is by Messrs. Armstrongs, and the machinery is ready now waiting to be put in. The stocks will be empty, but for the second-class cruiser *Liverpool* and the Canadian ice-breaker. Thus everything is in favour of Barrow getting an order for a "Dreadnought." Then there is the machinery side of the question. The Barrow yard, which makes its own turbines of the Parson's type, is not busy at present and could easily engine the "Dreadnought" that was being built at the yard and make another set for a sister ship building at the dockyard, or even Elswick. Altogether Barrow is in a favourable position at present, and it looks, taking everything into consideration, that this town is in for a period of activity, which will be a great boon, for there are a great number of unemployed at present walking the streets.

The Spanish Contracts.—At last the Spanish contracts are an established fact. The official Gazette in Spain has said so. Work will be commenced forthwith. Messrs. Vickers are to superintend the building of the three battleships at Ferrol. The material for these vessels will be supplied from works there, and from the three firms, Messrs. Vickers, Armstrongs and Browns, which are in the combination. All the work that can be done in Spain will be made there. The gun-mountings for the three vessels will be divided between Messrs. Vickers and Armstrongs, and will be made in this country. That means a big slice of work for each firm, which will keep them going for some considerable time. It is quite easy to see that extensions at the Barrow works will be necessary in view of this work, especially if one considers also that there may be some Japanese work to do also in the same department. No doubt, the boilers will be made in Spain, but the question is, will the three sets of turbines be made at Ferrol or at Barrow and Glasgow. It hardly seems possible that these delicate machines will be made abroad. Everything seems to point to the fact that Messrs. Vickers and Browns will be entrusted with the work, and if that is so it means more grist to the mill. Of course, there will be a certain amount of delay in commencing, for the firm of contractors, Messrs. Sir John Jackson, Ltd., have to build the new yard at Ferrol. This work will be pushed on with, no doubt, and in the meantime, material can be got ready. It is at the outset that the most men from this country will be employed, and as the construction proceeds more Spanish artisans will be introduced. A goodly number will go over at first, and this, of course, means more employment, for men will have to be found to fill up the vacant places in this country.

H.M.S. "Vanguard."—The work on this new "Dreadnought" is proceeding apace. The number of men on her are being increased weekly, and there will not be far short of a thousand engaged upon her now. A number of Babcock boilers have been placed in her, and these are being completed. At the time of writing several of the turbines have been placed in this vessel, and there has been no hitch in any way. One has only to notice the way she is settling in the water to realize the amount of material that is being put into her. Of course, after all the machinery has been put in, there will be a deal of work to do in regard to the fitting up and the preliminary runs. During that time, the guns and mountings will be getting fixed into the vessel. These are practically ready, and with the very large staff and the up-to-date machinery, there will be no loss of time. At the end of this year the *Vanguard* will probably be ready for her steam trials, if everything goes on all right.

The unfortunate accident which happened to the gangway fixed to the *Vanguard*, and which resulted in the death of one worker has had a curious result in the coroner's court. The jury, in their verdict, said that they were of the opinion that a more searching examination should have been made before the gangway was put into position. The coroner stated that this was contrary to the evidence that had been given, and that it practically amounted to a verdict of "Manslaughter." He called two witnesses and sent the jury back to reconsider their verdict. The jury returned and still persisted in the

verdict and the coroner refused to take it. He adjourned the inquest for a fortnight in order that he could communicate with the Home Office with respect to the obtaining of an independent expert witness.

The Brazilian "Dreadnought."—The Brazilian "Dreadnought" the *Sao Paulo* was launched on the 10th of last month by the wife of the Brazilian Minister, at London, Her Excellency Senhora F. Regis de Oliveira. This lady performed the ceremony on behalf of the wife of the President of the State of Sao Paulo, Brazil, Her Excellency Senhora Albuquerque Lino. Senhora de Oliveira has had a unique experience. She launched the *Minas Geraes*, at Newcastle, last September, and it does not come to everyone to christen two huge leviathans in six months. The *Sao Paulo* is a very fine vessel and should prove a great addition to the Brazilian Navy. True, she does not in many ways come up to the standard of efficiency of this country, and such talk as some panic makers have made regarding the duty of this country to purchase these vessels is highly ridiculous. I should have thought that our past experience with vessels that have been built to foreign order, and which have been bought into the navy, would have been enough. The old *Independencia*, purchased by Britain from Brazil, and re-named the *Neptune*, ought to have been enough for anybody, to say nothing of the *Triumph* and *Swiftsure*. The *Minas Geraes* and the *Sao Paulo* are splendid vessels for the Brazilian Republic, but that does not mean that they would be good for this country. If they were bought in by us there would have to be spent thousands upon thousands of pounds bringing them up to anything like our requirements. Let them go to Brazil. It will bring the Argentine into the market all the keener, and also Chili, who cannot afford to see an adjoining country arming with such terrors. In connection with the launch, which is dealt with in another part of this issue, the firm of Messrs. Vickers brought in a new rule. Admission to the yard was only by ticket. Hitherto the yard has been thrown open to the public. Further than this, no cameras were allowed in the yard. This applied to both amateurs and professionals. At the launch of the *Vanguard* there were several photographers whose ideas of their importance were rather in the skies. It was amusing in the end to see that the photographs which were published were mostly supplied by Messrs. Vickers, and were taken by their own official photographer.

The inclusion in the extensive staff of such a firm as Messrs. Vickers of an expert photographer has long been necessary. All machinery is regularly photographed and filed, and the high standard of the work can only be described by the word perfect. Recently this firm had bound up a series of important photos of ships in their completed state. It is a sort of album *de lue*. It is the last word in photography and artistic mounting.

S.S. "Dunottar Castle."—The Castle liner *Dunottar Castle*, which has done good service on the South African trade, will shortly come to Barrow to undergo extensive alterations internally. It is intended that the cabin portion shall be gutted and that a more extensive accommodation for first-class passengers be arranged. This vessel, it is understood, is to be altered in record time, and to the requirements of Dr. Lunn, of the Polytechnic Tours fame. She will probably take the place of the ill-fated *Argonaut*.

Canadian Crane.—It will not be long now before the 75-ton crane and grain elevator is ready for her voyage across the Atlantic to Montreal. Her first venture was disastrous. The weather was exceedingly stormy, and it had to be abandoned in the Atlantic. It was picked up by two steam trawlers, who, through the courts, picked up a pretty salvage award. Since then the crane has been tested. As much as 90 tons was lifted with ease, and the cant was but slight, considering the small draught of the pontoon—3 ft. 6 in. Preparations are being made now for the fixing of the jib, etc., in a position suitable for the voyage across.

Submarines.—There is considerable activity in the submarine department at present. The C20, C21, C22, are near completion, and will shortly leave, accompanied by H.M.S. *Vulcan*, the submarine attendant ship. It is said that their destination will be the Firth of Forth. The C23 and C24 are completing and naval lieutenants have already been appointed to their respective commands. The mysterious D1 still lies at the special wharf, and it will not be long now before she is ready for her trials. Something sensational may be expected from this vessel. It is not long since that Messrs. Vickers delivered two submarines to the order of Japan. It has been stated since that that country has secured the rights from Holland, of Philadelphia, of a new submarine, which will possess an enormous speed on the surface, and which, according to American advices, will lick creation. This remains to be seen.

Brazilian Scout.—The machinery for the Brazilian scout building at Elswick has been ready for some time, and is waiting for orders from Newcastle. This is the second set of machinery that has been constructed by Messrs. Vickers for Brazilian scouts. Two are being built at Newcastle of about 3,000 tons.

Dry Dock.—Rumours are again being circulated about the possibility of Messrs. Vickers going in for a monster dry dock at Barrow. Certain soundings have been made, but it is not known as to whether they are being made with a view of finding a suitable site. Barrow needs one badly, but the cost would be very great, owing to the nature of the ground, which at a depth is treacherous.

An Areoplane.—It has been in certain of the daily press that Messrs. Vickers are experimenting with an aeroplane. They may be, but if it is so, there is an element of secrecy that baffles all inquiries. It would not be surprising, though, for Messrs. Vickers, who are remarkable for their unhesitating desire to get at the last word in everything under the water and on the water, and so why not above the water?

Iron and Steel.—There is a welcome improvement at last in the iron and steel trade, and after an idle period of just over twelve months the Barrow Steel Works are about to re-start their rail mills. This will mean about 1,000 men going in. The distress in the town has been awful, and the relief will be most welcome. It looks as if the flood tide of activity was going to set in all round. Iron is on the turn, and there has been an improvement in prices to the extent of about 1/- per ton in warrants.

Shipping.—Shipping has only been moderate, but the exports of iron and steel this year, to date, shows an improvement of 23,000 tons in comparison with the aggregate for the corresponding period of last year. With the improvement in the iron and steel industry there will be an improvement in the shipping both as regards the exports of the metal and in the increase in imports of foreign ore.

MERSEY AND MANCHESTER SHIP CANAL.

(*From our Own Correspondent.*)

TRADE has been exceedingly bad during the past month, but there is every possibility of things livening up very shortly. Messrs. H. & C. Grayson have had the greater portion of the repair work, which included the alteration to the propellers of the *Lusitania*. The alteration consists in replacing her previous three-bladed propellers, with four-bladed ones, and in view of the recent success of the *Mauretania*—due to a similar alteration—it is expected that the *Lusitania* will now be able to break all previous records and increase on the speed obtained out of the *Mauretania*. Messrs. H. & C. Grayson have many other contracts in hand, all of more or less small dimensions, which include overhaul and repair to the s.s. *Devon* of London, the Pacific Steam Navigation Co.'s s.s. *Oriana*, and several other Liverpool steamers.

Cammell, Laird & Co., Ltd.—This company continues to be pretty busy, and the new River Plate liner for Messrs. H. & W. Nelson is now well in hand. The keel bar is laid, and a good portion of the frame work is already done. Amongst other repair jobs the company has in hand is a large hopper belonging to the Mersey Docks and Harbour Board, which they are converting into a dredger of the crab type. They are also overhauling two London dredgers, which will afterwards be employed in dredging the entrance to the new dock at Garston. They have also launched a large turbine steamer for Peru owners, named the *Ucayali*, which has been built under the superintendence of Mr. E. H. Bushell, of Liverpool. The vessel is 360 ft. long by 46 ft. beam by 23 ft. 9 in. depth, and is built to the highest class of British Corporation. The Parsons' turbines are built by Messrs. Cammell, Laird & Co., Ltd., and she will steam 18 knots per hour on a loaded draught of 20 ft. 6 in. She is exceptionally

well fitted out, and with her clipper bow has a very graceful yacht-like appearance. Her tonnage is 3800, and she will be engaged in the West Coast of South American trade. She has accommodation for 110 first and second class passengers and 200 third class.

The company is also carrying out extensive repairs to the Pacific Steam Navigation Co.'s *Potosi*, in addition to several other smaller jobs, including Admiralty repairs to destroyers. They are also tendering for one of the "Dreadnoughts," provided for in the Navy Estimates, and are very optimistic of securing the order, in which case great satisfaction will be expressed locally, as this would be the first warship of this type to be built on the Mersey.

White Star Liner "Laurentic."—This new vessel for the White Star Line's Canadian trade arrived in the Mersey on the 15th inst. from Belfast, where she has been built by Messrs. Harland & Wolff, Ltd. After having been in the hands of Messrs. H. & C. Grayson, Ltd., for some slight alterations to her propellers, she sailed from here on the 29th inst., taking her place in the new Canadian service of the company. Great interest is expressed in anticipating her performance, but everybody concerned seems to be fully satisfied that the combination of turbine with reciprocating engines, with which she is fitted, will prove both an economic and engineering success.

Crosby Channel Revetment Scheme.—Much satisfaction is expressed in local shipping circles that the work on the above scheme has now been started, and on the 15th inst. a number of members and officials of the Mersey Docks and Harbour Board witnessed the dumping of the first load of stones, which is being brought from North Wales for the purpose.

"Mahratta."—As is already known through the daily press, this vessel, belonging to the Brocklebank Line, was wrecked on the Goodwin Sands on Good Friday, and although the Liverpool Salvage Association are doing their utmost to salve her, they report that the work is being considerably interrupted by the high seas at present prevailing.

"Patrician."—During the Easter holidays a disastrous fire occurred on board the s.s. *Patrician*, belonging to Messrs. T. & J. Harrison, whilst lying in the Herculaneum Dock, and it was not until the 16th inst. that the whole of the fire was practically extinguished. The Liverpool Salvage Association, however, are carrying out salvage operations, and they have been successful in confining the damage to No. 6 hold.

I regret to report the death of Mr. J. B. Page, the late chief of the Liverpool Salvage Association, who passed away at the beginning of this month.

Messrs. Cammell, Laird, & Co., Ltd., I understand, will shortly probably be in a position to announce the name of their new chairman to take the late Dr. Elgar's place.

The marine engineering trade in Manchester district is much the same as last month, *viz.*, very bad indeed, and from enquiries made in reliable sources there appears to be little prospect of any revival for some considerable time yet.

SOUTHAMPTON.

(From our Own Correspondent.)

Messrs. Summers & Payne, Ltd., Belvidere, Northam.—The s.y. *Kethailes*, owned by Mr. Wm. Johnson, of Liverpool, and the s.y. *Sheelah*, owner Mr. J. Ross, of Montreal, are fitting out at the yard; also Lord Lonsdale's *Norseman* (auxiliary yacht) is at the yard awaiting orders for fitting out. Commander Sir Hamilton Freer Smith's *Pleione* (motor yacht) is fitting out and Mr. C. Grahame White's *Yum Yum* is being fitted with a 100-H.P. motor. A "Kelvin" motor has been fitted to Mr. Lane Fox Pitt's *Waterwitch*, and successful trial trips have been run and she is now fitting out. The *Elfrida*, a new yawl yacht built for Mr. Maskall, has left the yard for the East Coast. The *Roy* is being prepared for the installation of a 50-H.P. Clift motor. *Calisaya* is being recoppered. S.Y. *Lantana* (Mr. Matthew Cope) is fitting out and was slipped last month. The large ketch yacht building for Sir Maurice FitzGerald, Bart., was launched on the 5th of this month.

Messrs. Day, Summers & Co., Ltd., Northam.—The extensive alterations to the p.s. *Emperor of India, ex-Princess Royal*, owned by Messrs. Cosens & Co., of Weymouth, are now completed. The promenade deck has been carried right forward to the stem and the plating carried up from the main deck to the new promenade deck. The boiler has been shifted aft and other alterations were carried out to improve the trim. The appearance of the vessel has been completely altered. The new 226-ton steam yacht for Col. Gascoigne was launched on the 21st of last month, and is now fitting out. The s.ys. *Hiawatha* and *Madrigal* have been put through Lloyd's Survey, and the latter is fitting out.

The Parsons Motor Co., Ltd., Town Quay, have booked orders for two additional 7-H.P. sets for the Channel Islands, following one ordered and delivered last month. One of these sets is for auxiliary power and the other for launch work. Mr. Armour has placed an order for a 21-H.P. set for a launch building to his order, and a 14-H.P. set was despatched to France last month, also a further 7-H.P. set is on order for China. Last month the following installations were in hand:—*Cettic*, a 7-H.P. auxiliary. Ashton and Kilner, 7-H.P. launch set. Mr. Beamish's cruiser twin 28-H.P. sets and a 60-H.P. set for a fishing vessel. *Meg Merrilies*, 28-H.P. Parsons set had a solid shaft and propeller fitted in place of reversible propeller. Orders are being booked daily for the company's various specialities, such as water-cooled silencers, universal joints, pumps, boatside fittings, etc., etc., which, together with repair work, are making the company increasingly busy.

Messrs. J. I. Thornycroft & Co., Ltd.—H.M.S. torpedo boat destroyer *Nubian* was successfully launched from the Woolston Yard on the 20th April last. H.M.S. torpedo boat destroyer *Amazon*. The repairs to the turbine machinery have been completed and the vessel was handed over to the Admiralty early last month. The steam tug and passenger flat for China were shipped off Netley early last month. H.M.S. torpedo boat destroyer *Savage*: The work on this vessel is steadily advancing. The steam yacht *Napsugar* is completing preparatory for her trials, also the steam yacht for Lord Leith is advancing in construction. The following repair work was also in hand last month:—Bridges for Admiralty fisgards and water boat "Test," also crane work for local firms. Repairs were also effected for the dredger *Mercurius* and to steamship *Hero*, which was in collision with the torpedo boat destroyer *Blackwater*. The *Hero* arrived in the dock on the 8th of last month with damage to bows as the result of the collision. Five of the torpedo boat destroyer's frames and the shell plating in way of same were firmly wedged into the port bow of the *Hero*, also the starboard bow plating was badly indented. The *Blackwater* sank, but fortunately the whole of the crew were saved.

THAMES.

(From our Own Correspondent.)

Port of London Authority.—Since our last notice Mr. Owen Philipps, M.P., has been appointed as vice-chairman and Mr. R. Philipson permanent secretary. The work of the authority is divided into six committees—docks and warehouse, river, finance, staff and stores, works and improvements, Parliamentary, the several chairmen of these committees being respectively Mr. J. G. Broodbank, Mr. Varco Williams, Mr. Hugh Colin Smith, Mr. S. E. Bates, Sir Edwin Cornwall, M.P., and Lord Ritchie of Dundee. The vice-chairman will be recognised as head of the Royal Mail Co. The preparation of a schedule of rates on goods may be delayed as long as the end of this year owing to the complexity of the subject. The Waterman's Co., with its powers, will be taken over on July 1st. The Millwall Dock Equipment Co. has been served with a notice to be taken over twelve months hence. A meeting of the London Waterside Manufacturers' Association has shown how this body was able to safeguard the river users' interests against those of the docks, the dues payable being limited to £330,000, divided as to one-third for the river and two-thirds to the dock users,

but as the amount of tonnage is different in the two cases, goods in the river will pay really about one-fifth the amount those using the docks will pay.

Thames Conservancy.—This new body has been appointed with power quite different to that of the same name it supersedes. Lord Desborough is the chairman as before, but the work will have nothing to do with the lower reaches of the river below Teddington. The Board of Trade, the Port of London, the Water Board and the London County Council are represented, besides the various authorities on the river banks and immediate vicinity concerned, twenty-eight members in all. Mr. F. W. Geary was appointed acting secretary.

The Thames Steamboats.—The last stage in this matter has been reached by the resolution passed at the County Council to sell the boats, and it is understood tenders have been accepted for the purchase of three and that the remainder will be advertised by public action. Even to the last the party responsible for this undertaking persisted in wishing to spend public money in running the boats at a loss, but were, as we have said, defeated and by a large majority. It appeared during the discussion that the cost of laying up the boats amounted to £4385 a year, and the maintenance of the piers a further £3750. These latter will revert to the port authority in October, so a considerable sum will be saved by the proposed action.

Steamship Companies.—The fourth of the Orient Co.'s boats to be built has been successfully launched from the yard of Messrs. Workman, Cark & Co. at Belfast. She is named *Otranto*. All these boats are to be equipped with wireless telegraphy, the first to be so fitted in the Australian trade and flying the British flag. The African S.S. Co. have held their annual meeting with Lord Pirrie presiding. A distribution of 5 per cent. was made and the company described as being in a very prosperous position. The General Steam Navigation Co. are ordering a new boat for river service to steam at 18½ knots. The vessel will run to Margate, Southend, etc., from London Bridge.

Across River Communication.—Southwark Bridge is likely to be completely rebuilt, a proposal being under consideration to have a widened structure. The present bridge is only 42 ft. 6 in. wide between parapets, and it is probable this will be increased to 80 ft. to allow for a double line of tramways, the cost being about £1,000,000. The gradients will be reduced to facilitate traffic. Such a work will be a large one as far as the river is concerned, as the present structure will come down to make way for the new one. A bill called the Thames Tunnel (North and South Woolwich) Bill came before a Parliamentary Committee and was allowed to proceed. This provides for a subway under the river at the point named at an estimated cost of £112,000.

The Port of Dover.—The visit of the Atlantic fleet to the port was the occasion for a reception by the Admiral, Prince Louis of Battenberg of Lord Brassey, the Lord Warden of the port, the civic and other authorities combining to do honour to the occasion. Another service of steamers is down to make use of this harbour and the facilities afforded. In this case it is the Royal Holland Lloyd Steamship Co. The fleet of this line run to French and Spanish ports, and from thence across to South America. A beginning will be made with two new steamers, the *Hollandia* and *Frisia*, each 435 ft. long by 54 ft. beam and 38 ft. deep, up-to-date modern boats.

BELFAST.

(*From our Own Correspondent.*)

IN view of the fact that shipyard hands are—so far as Belfast is concerned, at any rate—notorious for not resuming work on the day appointed after holidays, it is interesting to note that a short time before Easter a deputation representing the various trades unions waited upon the local employers with a request that shorter holidays should be given. The natural reply of the masters was to the effect that no matter what length of time the yards might be closed for, the majority of the men never returned to work on the proper day. There are, of course, a number of steady workers who have sufficient sense to know that the longer they remain out the worse it is for themselves and their families; but by far the greater number dearly love to show their independence by always taking an extra day or two. As a matter of fact, operations were to have been resumed in the local yards on the Wednesday after Easter, but thousands came down and walked off home again, and it was Friday before anything like a proper start was made. The sooner the unions can show that they are able to control their men in this matter the sooner will the employers show a desire to meet their wishes as regards holidays.

Messrs. Harland & Wolff.—Two notable vessels have left the Queen's Island since last month's notes were penned, namely, the Red Star liner *Lapland* and the White Star Canadian liner *Laurentic*. The former vessel is 620 ft. long by 70 ft. beam by 50 ft. deep, and 18,565 tons gross register, and is by far the largest vessel sailing under the Belgian flag. The *Laurentic* is propelled by a combination of turbine and reciprocating machinery, and a highly successful preliminary run to Liverpool and back was referred to in the March issue of the *Marine Engineer*. It only remains to be said that the result of the formal trial trip, which was carried out immediately after the Easter holidays, did not in any way detract from the builders' confidence in this method of propulsion. Messrs. Harland & Wolff have still a considerable amount of tonnage at the fitting-out wharves. In addition to the *Megantic*—sister ship of the *Laurentic*—there are the Atlantic Transport Co.'s fine new liner *Minnewaska*, the *Karoola*, built for Messrs. McIlwraith, McEacharn & Co., and the United Steam Navigation Co.'s *Mallina*. The last-mentioned steamer, which was launched on 25th March, is 363 ft. 6 in. long, has a gross tonnage of about 3200, and has been specially designed for the Colonial trade. The *Minnewaska* is almost ready for sea, and the Atlantic Transport Co. has announced that she will sail on her first voyage from Tilbury to New York on May 1st.

Messrs. Workman, Clark & Co.—On Saturday, 27th March, this firm launched the fine 12,000 twin-screw liner *Otranto* for the Orient Co. The launch was attempted a few days previously, but owing to severe frost affecting the tallow, the vessel refused to leave the ways. The *Otranto* is 554 ft. long, and will have accommodation for 450 saloon and 850 third-class passengers. A sister ship is in course of construction at Messrs. Workman, Clark & Co.'s yard. The Tropical Fruit Steamship Co.'s *Abangarez* has left the builders' hands after a highly successful trial trip, and the *Turrialba*, built by the same firm for this company, will shortly be ready for sea.

The Harbour.—The question of closing the cross-river ferry which runs between the upper ends of the Queen's and Donegall Quays has more than once received the attention of the Harbour Commissioners, and now it has been definitely decided to discontinue the service. The ostensible reason for doing so is for the purpose of gaining additional quay space, and thus doing away with the overlapping of the cross-channel steamers lying at the Donegall Quay, but there is little doubt that the fact that the ferry does not pay largely influenced the Commissioners in their decision. The Belfast Harbour Commissioners appear to forget—or, perhaps they refuse to remember—that a trust such as this is bound to provide for the public convenience, and the question for them is not whether certain individual undertakings pay, but whether the Port as a whole pays.

The late Sir Donald Currie.—Through the death of the "Grand Old Man of Shipping" Belfast has lost one of its honorary burgesses, he being ninth in a list of eleven. He was elected on 1st May, 1906. Sir Donald spent some of his earlier years in Belfast, and although he did not very often visit Belfast in after life, he always showed that he had not forgotten the city of his youth.

Launch of H.M.S. "Nubian," 33-knot Torpedo Boat Destroyer.—In the presence of a numerous company, the Destroyer *Nubian* was launched last month. The *Nubian* is one of the series of 33-knot destroyers of which Messrs. Thornycroft have now delivered two, *viz.*, H.M.S. *Tartar* and *Amazon*, from their Southampton Works. The new vessel is 280 ft. in length and is fitted with turbine machinery and boilers using oil fuel. A speed of 33 knots as a mean of six hours' running is guaranteed, this being exceeded in the case of H.M.S. *Tartar*, the first of the series, by over 2¼ knots. The armament consists of two 25-pounders and two 18 in. torpedo tubes.

LAUNCHES AND TRIAL TRIPS.

LAUNCHES English.

Turrialba.—On March the 11th, Messrs. Workman, Clark and Co., Ltd., launched from their South Yard the steamer *Turrialba* of about 5000 tons gross register, for the Tropical Fruit Steamship Co., Ltd., Glasgow, Messrs. Clark & Service, managers. The new vessel is intended for the West Indian banana trade, and has accommodation for a number of passengers. The holds are divided into eight compartments, all of which are insulated for the preservation of the fruit cargoes, fresh cooled air being delivered through ducts to each compartment by electrically-driven fans. The vessel has been built under the special survey of the British Corporation for their highest class, and both the requirements of the British Board of Trade and the United States Steamship Passenger Inspection Service have been fully complied with. The vessel will be fitted with triple-expansion engines constructed by the builders, and is designed for a speed of about 15 knots per hour.

Patella.—On March the 11th, this vessel, which is being built by Messrs. Swan, Hunter & Wigham Richardson, Ltd., of Wallsend-on-Tyne, to the order of The Anglo-Saxon Petroleum Co., Ltd., of 20, Billiter Street, E.C., was launched by Mrs. Coney. This vessel is being built for the petroleum trades specially with a view to carrying various kinds of oil in one cargo. She has the highest class at Lloyd's and is being superintended during her construction by Messrs. Flannery, Baggallay & Johnson, of London, Liverpool and Rotterdam. Her dimensions are 418 ft. overall. 51 ft. 3 in. extreme breadth, and 31 ft. moulded depth, and will carry 7750 tons of deadweight on a light draught. The engines are supplied by Messrs. The Wallsend Slipway and Engineering Co., Ltd., of Newcastle-on-Tyne, and have cylinders 26·2 in., 43 in. by 48 in. stroke, taking steam from three single-ended boilers. The vessel has pump rooms and is fitted with electric light and winch gear for quick and efficiently handling of the vessel. Oil pumps have been supplied and fitted on this vessel by Messrs. Hayward, Tyler & Co., Ltd.

Chira.—On March the 13th, Messrs. Smith's Dock Co. launched from their North Shields yard the screw tug *Chira*, of London. The tug was gracefully launched by Mrs. Frank Morris. The vessel is 90 ft. long, 19 ft. breadth, and 7 ft. 9 in. moulded depth. She is constructed to carry a deadweight of 100 tons, having a special tank for carrying oil in bulk. She is to the order of Messrs. Lane & Macandrew, on behalf of William Keswick, Esq., M.P., of Leadenhall Street, E.C., and is being built under the supervision of Messrs. Flannery, Baggallay & Johnson, of London, Liverpool and Rotterdam, and is classed 100 A1 at Lloyd's. The engines are by the Shields Engineering Co., and the boiler is constructed by Messrs. Eltringham, of South Shields, and the vessel is fitted with electric light and towage appliances. She is also fitted for oil fuel and coal burning.

The Stewarts Court.—On March the 20th, Messrs. S. P. Austin & Son, Ltd., launched from their shipbuilding and repairing establishment at the Wear Dockyard, Sunderland, the steel screw steamer *The Stewarts Court*, classed 100 A1 in Lloyd's Register, which has been built to the order of S. J. Ditchfield, Esq., of Seaham Harbour. She is designed to carry about 1050 tons deadweight on a light draught, and is specially adapted for the coal trade. Accommodation for the captain and officers is provided in the poop and for the engineers in the bridge. The machinery will be supplied by the North-Eastern Marine Engineering Co., Ltd., of good power. The deck machinery includes steam windlass by Messrs. Clarke, Chapman, & Co. Ltd., steam-steering gear by Donkin & Co., steam winches by the Seaham Harbour Engine Works, and will be driven from a Blake multitubular donkey boiler. The construction has been carried out under the superintendence of Mr. J. W. Chilton, of Seaham Harbour, on behalf of the owners, and the vessel was gracefully named by Mrs. Grimes, wife of the secretary of the Seaham Harbour Dock Company.

Telconia.—An interesting special service steamer has been launched by Messrs. Swan, Hunter & Wigham Richardson, Newcastle-on-Tyne. This vessel, the cable repairing steamer *Telconia*, is being built for submarine cable laying and repairing purposes to the order of the Telegraph Construction and Maintenance Company, London. She is a steel twin-screw steamer, 205 ft. in length by 30 ft. 9 in. beam. The cable tanks, two in number, have over 7,500 cubic feet of space in which to coil cable, and there is in addition a hold for carrying buoys, grapnels, etc., besides very large bunker capacity.

Monkstone.—On March 23rd, Messrs. Robert Thompson and Sons, Ltd., launched from their Southwick yard, a first-class cargo steamer, built to the order of the Rosella Steamship Co., Ltd. (Messrs. Elvidge & Morgan, of Cardiff, Managers). Her principal dimensions are :—Length B.P. 330 ft. 6 in. ; breadth extreme, 47 ft. ; and depth moulded, 24 ft. 4 in. ; and is classed 100 A1 at Lloyds, under special survey. She has been built to the three deck rule with single deck, and designed to carry a large deadweight cargo on a light draught. Ample water ballast is provided for in the cellular double bottom fore and aft, with large upper and lower after peak tanks, the engine and boiler room tank and bunkers being coated with enamel. A full cargo poop and cargo bridge is fitted and top gallant forecastle for the petty officers and crew. Accommodation is provided for the captain, spare room and steward, with dining saloon, etc., tastefully fitted up in different shades of oak in a large house on the fore end of the bridge, with chart room and wheel house above under the upper flying bridge. The officers and engineers, with messroom, bathroom, etc., are placed in steel houses abreast of engine casing. There are five cargo hatches with double derricks to each, complete with all appliances for rapid loading and discharging of cargoes and worked by powerful steam winches supplied by Messrs. John Wigham & Son, and a large multitubular donkey boiler by Messrs. MacColl & Pollock, Ltd., of ample capacity for the supply of steam to the deck machinery. The steam windlass has been supplied by Messrs. Emerson, Walker & Thompson Bros., Ltd., and the steering gear by Messrs. Donkin & Co. The engines are by Messrs. George Clark, Ltd., and have cylinders 24 in., 38 in., and 64 in., with a stroke of 42 in., steam being supplied by large boilers working at a pressure of 180 lbs. per square inch. During the construction both the hull and machinery have been under the personal supervision of Mr. W. H. Robson, of Cardiff. After a successful launch, the vessel being gracefully christened *Monkstone*, by Mrs. Elvidge, wife of one of the managing directors of the purchasing firm, the party returned to the offices of the builders, where the usual toasts were proposed and responded to.

Kingswear.—On March 23rd, Messrs. Wood, Skinner and Co., Ltd., successfully launched from their shipbuilding yard at Bill Quay, Newcastle-on-Tyne, a new steel screw steamer of about 2,150 tons deadweight, which has been built by them to the order of Messrs. Renwick, Wilton & Co., Ltd., of Dartmouth and Torquay. The vessel has been constructed to the requirements, and under the special survey, of Lloyds for their highest classification, and has also been superintended during building by Mr. Thomas Boulton, of Newcastle-on-Tyne. She is of the single-deck type, with poop, bridge and topgallant forecastle, and the saloon, captain's accommodation, etc., is arranged under the bridge deck amidships, the officers and engineers being berthed in the poop and the crew in the topgallant forecastle. Extra large water ballast capacity is provided in cellular double bottom, all fore and aft, and in the fore and after peak tanks. The vessel has large hatches for self-trimming and will be fitted with electric light, etc., to meet the regulations as an Admiralty transport collier. The machinery, which consists of a set of triple-expansion engines, has been constructed and will be fitted by Messrs. The North-Eastern Marine Eng., Co., Ltd., at their Northumberland engine works, Wallsend-on-Tyne. The vessel was gracefully christened *Kingswear*, by Mrs. T. Wilton, of Dartmouth. Messrs. Wailes, Dove & Co.'s "Bitumastic" covering was applied to the tank top, under boilers, and "Bitumastic" solution to the bunkers, etc.

Alpha.—The Goole Shipbuilding Company have launched a large floating pontoon, specially built to expedite the shipment of coal from the port. This unique vessel, which is the only one of its kind in the world, has been built to the order of the Aire and Calder Navigation, and has been specially designed by them in conjunction with Messrs. Armstrong, Whitworth & Co., Elswick, and the builders, for lifting com-

partment boats laden with coal, which vessels carry about 40 tons. The pontoon is 115 ft. long, 46 ft. 6 in. broad, and 17 ft. 11 in. deep. Her displacement will be about 1,000 tons. The vessel is peculiar in shape, the principle followed being that of a floating dock. With the hydraulic hoist loaded compartments will be lifted bodily out of the water, tilted, and their contents shot into a vessel's hold. As the operation of emptying a compartment will take from one to three minutes it will be possible to enship many thousands of tons of coal in one day.

Uromi.—On April 2nd, Messrs. W. Harkess & Son, Ltd., of Middlesbrough, launched a twin-screw mail and passenger steamer, which has been built to the order of Messrs. Elder, Dempster & Co., for their West African Branch Service. The vessel's dimensions are 225 ft. by 36 ft. by 14 ft. moulded, and she will carry 1,200 tons on 12 ft. draught, and be fitted with engines capable of driving her a speed of 12 knots loaded. She is built to a very full specification, and is the third sister ship and the sixth steamer these builders have recently launched for Messrs. Elder, Dempster & Co. On leaving the ways she was christened *Uromi*, by Mrs. Roxburgh, wife of the resident superintending engineer of the company.

Boscawen.—On April 6th, Messrs. Craig, Taylor & Co., Ltd., launched from their Thornaby shipbuilding yard, Thornaby-on-Tees, a finely-modelled single-deck screw steamer of the following dimensions, *viz*:—290 ft. by 40 ft. 9 in. by 20 ft. 6 in. moulded. She is built of steel to the highest class in Lloyd's, under special survey, and has poop, bridge and topgallant forecastle; water ballast in double bottom fore and aft, and in peaks. She is equipped with patent steam windlass with quick warping ends, steam steering gear, four steam winches, and suitable donkey boiler, pole masts to Manchester Ship Canal requirements, large hatches, and all the latest improvements for rapid loading and discharging. The accommodation for captain and officers is neatly fitted up in poop, the engineers being in deckhouse alongside engine casing, and the crew in the forecastle. Her engines have been constructed by the North-Eastern Marine Engineering Co., Ltd., Sunderland, the cylinders being 21½ in., 36 in., 59 in. by 39 in., with two large steel boilers working at 180 lbs. pressure. The vessel has been built to the order of Messrs. F. Jenkins & Co., of Cardiff, under the superintendence of Messrs. H. T. & F. G. Daniel, of Cardiff. As she left the ways she was gracefully christened the *Boscawen*, by Mrs. Jenkins, wife of the owner.

Shotton.—On April 7th, there was launched from the yard of Messrs. Cochrane & Sons, shipbuilders, Selby, a handsomely-modelled steel-screw coasting steamer, the principal dimensions being 135 ft. by 23 ft. by 10 ft. 6 in. moulded. The vessel has been built to the order of Messrs. Coppack Bros. & Co., of Connah's Quay, Flint, and will be fitted with powerful compound surface condensing engines by Messrs. C. D. Holmes & Co., Ltd., of Hull, having cylinders 17-36 in. by 24 in. stroke, with boiler 12 ft. 6 in. by 10 ft. 3 in., 130 lbs. pressure. As the vessel left the ways she was gracefully christened the *Shotton*, by Miss Lilian Coppack, of Connah's Quay, daughter of Mr. T. Coppack, managing director of the company, after which the party adjourned to the builder's offices, where the customary toasts were given and responded to.

LAUNCHES—Scotch.

Pangan. On February 22nd Messrs. Barclay, Curle and Co., Ltd., launched the single-screw vessel *Pangan* (built for foreign owners), her dimensions being 343 ft. by 37 ft. 3 in. by 29 ft., with full poop, bridge and topgallant forecastle, gross tonnage 3,500, cellular double bottom all fore and aft for water ballast, built girders with wide spaced pillars are fitted in the main holds, and accommodation is provided for a limited number of first-class passengers. Messrs. Wailes, Dove & Co.'s "Bitumastic" enamel was applied to the bunkers and their "Bitumastic" covering to the tank top in the boiler room.

Hopper Steamer.—On March 6th, Messrs. Fleming & Ferguson, Paisley, launched an 800 ton hopper steamer. The steamer is one of three such vessels which the firm have in hand for the Argentine Government.

Itapuca.—On March 22nd, the Ailsa Shipbuilding Company, Troon, launched a twin-screw passenger steamer to the order of the Cia. Nacional de Nav Costeria, Rio de Janeiro. The vessel, which is a sister ship to the *Itajuba*, built by the Ailsa Company last year for the Brazilian coasting trade, is of the following dimensions:—270 ft. by 42 ft. by 18 ft. 6 in. moulded. Accommodation is provided for 66 first-class and 50 steerage passengers. When fully laden the vessel is expected to attain a speed of 12 knots. She is fitted with two sets of triple-expansion engines. Messrs. Wailes, Dove & Co.'s "Bitumastic" cement was applied to the double bottom, all fore and aft, also their "Bitumastic" enamel to the structures all fore and aft, also in bunkers, peaks, ballast tanks, etc. The vessel was named *Itapuca* by Mrs. John H. Campbell, Hughenden, Irvine. Luncheon was afterwards served in the drawing office, the Marquis of Ailsa, the chairman of the company, presiding.

Aberdonian.—On March 23rd, there was launched from the shipbuilding yard of Messrs. David and William Henderson and Co., Ltd., Partick, Glasgow, a finely-modelled twin-screw steamer which they have built for Messrs. The Aberdeen Steam Navigation Co., Aberdeen, for their Aberdeen and London trade. The vessel is 276 ft. long over all, 36 ft. breadth moulded, depth moulded 19 ft. 6 in., with a poop, bridge and topgallant forecastle extending nearly all over the vessel. The accommodation for 100 first-class passengers consists of a saloon handsomely panelled in polished oak, ladies' cabin, a smoking room and a music room, while on deck, in steel deck houses, are numerous roomy and comfortable staterooms, everything that can add to the comfort and convenience of passengers being fitted. The second-class accommodation for 200 is fitted up under the topgallant forecastle, and in forward 'tween decks, and is of an exceptionally comfortable character. Special attention has been given to the means of rapidly loading and discharging cargo, for which two powerful steam cranes and one winch are fitted. The vessel has a complete electric installation throughout, and powerful cargo lights are fitted to facilitate discharging cargo at night. A steam windlass, two warping capstans and steam steering gear of the most modern pattern are also fitted. In the after 'tween decks a large space has been fitted up as a cold chamber for carrying meat, fish, etc., and is cooled by one of Hall's machines on the CO_2 system. Electric bells and steam heating conduce to the convenience and comfort of the passengers. On the main deck all necessary fittings and arrangements are made for the cattle, horse and sheep trade of the company. The machinery consists of a powerful set of triple-expansion engines, having cylinders 26 in., 44 in. and 72 in. diameter by 42 in. stroke, complete with all the most up-to-date improvements, steam being supplied from two large double-ended boilers working at 180 lbs. pressure, while a large donkey boiler supplies steam for all the auxiliary and deck machinery. The vessel has been built under special survey of Lloyd's highest class 100 A1, and to the Board of Trade requirements for a passenger certificate for 350 passengers. On leaving the ways the vessel was named *Aberdonian*, by Mrs. Arnold J. Henderson, Southfield, Newton Mearns. The owners were represented by T. Adam, Esq., Denmore, Aberdeen, a director of the company; E. Savage, Esq., general manager; and Mr. W. Brand, superintendent, under whose personal supervision the vessel has been built.

Alster.—On March 23rd, Messrs. Ramage & Ferguson, Ltd., Leith, launched a steel-screw cargo steamer which they have built to the order of the Leith, Hull and Hamburg Steam Packet Co., Ltd., of which Messrs. James Currie & Co., Leith, are the managers. This vessel has been built for the Baltic and general trade of the company, and will carry about 1,175 tons deadweight on Lloyd's winter load line. The steamer is fitted with all modern appliances for rapid handling of cargo and has a complete electric light installation. The machinery, which is made by the builders, consists of a set of triple-expansion engines with cylinders 16½ in., 27 in. and 44 in. diameter by 30 in. stroke, supplied with steam from two boilers working at 180 lbs. pressure. On leaving the ways the vessel was named *Alster*, by Miss Crawford, 21, Stirling Road, Trinity. The *Alster* is a sister ship to the *Oder*, which was recently built by the same firm and which sailed on her first voyage last week.

Tortuguero.—On March 24th, Messrs. Alex. Stephen & Sons, Ltd., Linthouse, launched a finely-modelled steamer for the fruit trade of Messrs. Elders & Fyffes, Ltd., between the West Indies, Central America and Manchester. The vessel has a

[illegible] a gross tonnage of about 4,200, and is somewhat similar in [illegible] built by Messrs. Stephen for the same owners. She has excellent accommodation for a number of passengers in a large saloon house on deck, with saloon, smoking room, etc. The officers and engineers are also housed on this deck. The principal feature of the vessel is the insulated hold storage of 200,000 cubic ft. capacity, cooled by refrigerating machinery on the CO_2 system by Messrs. J. & E. Hall, of Dartford, for bringing bananas, oranges, etc., from the West Indies to this country. She is fitted with triple-expansion engines, having cylinders 27 in., 45 in. and 75 in. diameter by 54 in. stroke. A Cochran (Annan) donkey boiler with patent seamless furnace has been supplied. Facilities for the rapid loading and discharging of cargo are provided. The vessel was named *Tortuguero*, by Miss Mary Stephen.

Neva.—On March 24th, the Clyde Shipbuilding and Engineering Co., Ltd., Port-Glasgow, launched a steel-screw steamer for the Baltic trade of the Stott Line, Ltd., of Liverpool. The vessel is 295 ft. by 42 ft. by 20 ft., and has been constructed to British Corporation highest class, under the superintendence of Mr. T. B. Stott, of Liverpool. The vessel was named *Neva*, by Mrs. W. H. Stott, and immediately after the launch was placed in the company's dock to receive her machinery, which has also been constructed by the builders.

Granuweal.—On April 3rd, Messrs. Alexander Hall & Co., Ltd., launched from their shipbuilding yard at Footdee, Aberdeen, a steel-screw trawler built for Messrs. A. Milne & Sons, provision manufacturers, Aberdeen. The trawler, which was named *Granuweal*, measured 110 ft. long by 21½ ft. wide and 12¼ ft. moulded depth. She will be fitted with engines indicating 400 h.p.

Barbara Cowie.—On April 3rd, Mr. William Geddes, Port-Gordon, launched a fishing steamer 88 ft. in length, named *Barbara Cowie*. The owners are Messrs. John Cowie & Sons, Buckie. Messrs. Clyne, Mitchell & Co., Aberdeen, will fit the vessel with triple-expansion engines.

Moray View.—Messrs. Mackie & Thomson, Govan, have launched a steel-screw steam drifter for Mr. David Main, Hopeman, Morayshire. The vessel is 86 ft. long, 18 ft. in moulded breadth, and 9 ft. 6 in. in moulded depth. She will be fitted with compound surface condensing engines by Mr. W. V. V. Lidgerwood, Coatbridge. Both hull and machinery are classed 100 A1 at Lloyd's. The vessel was named *Moray View*, by Miss Main, daughter of the owner. The vessel is the shipbuilders' No. 379.

LAUNCHES—Irish.

Mallina.—On March 25th, this steamer, which has been built by Messrs. Harland & Wolff, Ltd., for the Australasian United Steam Navigation Co., Ltd., was successfully launched at Belfast. The new vessel is 363 ft. 6 in. long by 44 ft. 3½ in. beam, and about 3200 tons. The *Mallina* is rigged as a fore and aft schooner, with bridge, forecastle and poop, and has been built to the highest class at Lloyds, also specially designed for the Colonial trade. The vessel will be lighted throughout with electricity, and have all the latest improvements for a vessel of her class. The machinery, also constructed by Messrs. Harland & Wolff, Ltd., is of the quadruple expansion "balanced" type.

Otranto.—On March 27th, Messrs. Workman, Clark & Co. successfully launched from their yard at Belfast the twin-screw steamer *Otranto*, built to the order of the Orient Steam Navigation Co. She is 554 ft. in length, with a tonnage of about 12,000, and is the fourth vessel of similar size and character launched within the past five months for the Orient Company. These, together with another steamer also under construction at Belfast, have been designed to fulfil the conditions of the new contract which the Orient Company have entered into with the Commonwealth Government for an accelerated mail service for ten years at an annual subsidy, until 1920, of £170,000 per annum. The passenger accommodation of the *Otranto* is extensive and elaborate. She will carry upwards of 450 saloon and more than 850 third-class passengers. The second-class accommodation is arranged amidships, on the upper and shelter decks, and is scarcely inferior to the first-class. A great advance has been made in the accommodation provided for the third-class passengers. They have a commodious dining saloon, a ladies' music room, and an excellent smoking-room, whilst the deck space available for their exercise and amusements is unusually extensive. In the attempted launch of this vessel on the 23rd March a hitch occurred. When the signal was given the vessel remained stationary, and in spite of great pressure applied by hydraulic jacks she only moved a short distance. The failure was attributed to the effect on the tallow of the severe frost which had prevailed since the ways were built.

TRIAL TRIPS.

Duva.—On March 18th, the steamship *Duva*, of about 2200 tons deadweight, built by the Campbeltown Shipbuilding Co., for Messrs. J. T. Salvesen & Co., of Grangemouth, ran trials at Wemyss Bay. The *Duva* is of the well-deck type with raised quarter deck, bridge and topgallant forecastle, is built in excess of Lloyd's highest class and is specially arranged for the owner's timber and general trade. The machinery was supplied by Messrs. D. Rowan & Co., Glasgow. A Cochran (Annan) donkey boiler with patent seamless furnace has been supplied. On the trial a mean speed of about 11 knots was attained.

Hollandia.—On March 22nd, the new Royal Holland liner *Hollandia* attained a speed of 15 knots on trial, and on the twenty-four hours' run the rate guaranteed by her builders, Messrs. Alexander Stephen & Sons, was exceeded.

Brugia.—On March 24th, the steamship *Brugia*, lately launched by Messrs. Short Brothers, Ltd., left the Wear for her official trials. The vessel, which has been built to the order of Messrs. T. Nolson & Co. for the Ghent Lloyd Societe Anonyme of Ghent, is over 290 ft. long and carries a cargo of 3500 tons deadweight. She takes the highest class of Germanischer Lloyd and is specially designed with clear holds and large hatches for the timber and coal trades. The bows have been specially strengthened to enable the steamer to frequent ice-bound ports in winter and ample water ballast is provided throughout double bottom and in fore and after peaks. Large deckhouses are built on the long poop deck with saloon tastefully fitted in polished hardwood and captain's, officers' and engineer's rooms, the crew accommodation being arranged in the forecastle. Five steam winches, steam stearing gear amidships controlled from poop standards in wheelhouse and upper flying bridge and connected to quadrant tiller by rods and chains, steam windlass with quick-warping ends are supplied, all driven from a large donkey boiler fitted in stokehold. The cargo derricks have been specially arranged to enable the timber cargoes to be expeditiously handled, and in addition gaffs are fitted at heads of masts for coal or grain. The propelling machinery is by the North-Eastern Marine Engineering Co., Ltd., of Sunderland, and consists of engines with cylinders 21.33 in., and 56 in. diameter, with a stroke of 36 in., taking steam from two multi-tubular boilers working at 180 lbs. pressure. On the trial runs the vessel maintained a speed of 10 knots. Amongst those present at the trial trip were Mr. and Mrs. Nolson, Mr. Joseph Short (managing director of Short Brothers Ltd.), Mr. Weir (of the North-Eastern Marine Engineering Co., Ltd.), and other friends.

Harlesden.—On March 27th, the new steamer *Harlesden*, built by the Sunderland Shipbuilding Co., Ltd., was taken to sea upon her official trial. The principal dimensions are 365 ft. length between perpendiculars by 50 ft. 6 in. broad by 29 ft. 6 in. deep, having long bridge and poop, both of which are utilized for cargo and topgallant forecastle. The vessel has been built under the special survey of Lloyd's, and will take their 100 A1 class as a spar deck steamer with freeboard, and has two complete decks laid, which gives her a spacious 'tween deck all fore and aft. Accommodation is placed on the top of bridge for captain, officers and engineers, a handsome saloon in polished oak is also fitted there, on top of that accommodation a chart and wheel house are fitted with flying bridge on top. Most careful attention has been given to rapid loading and discharging, and also to the ventilation of holds, which is to the owner's special requirements, ten steam winches are fitted with ten derricks, a large multi-tubular marine type donkey boiler is also supplied, together

with direct-acting steam windlass with quick-warping ends, and an extra large steam steering gear. The deadweight carrying capacity of the vessel is about 7400 tons, with a proportionately large cubic capacity. The machinery is supplied by the North-Eastern Marine Engineering Co., Ltd., Sunderland, having cylinders 26 in., 42 in. and 72 in. by 48 in. stroke, steam being supplied by three large boilers working at a pressure of 180 lbs. per square in., they being also built to the requirements of the Hamburg Board of Police. The vessel has been built to the order of Messrs. J. & C. Harrison, Ltd., of London. Mr. W. Crandell, of Messrs. M. Burls & Partners, Ltd., London, under whose superintendence the vessel has been built, was present on the trial trip, and expressed himself as highly satisfied with the efficient working of the machinery, a speed of 11½ knots being obtained. The vessel left for Newport, Mon., where she will load for Bombay.

Abangarez.—On March 30th, the steamship *Abangarez*, built by Messrs. Workman, Clark & Co., Ltd., Belfast, for the Tropical Fruit Steamship Co., Ltd., Glasgow (Messrs. Clark and Service, managers), left Belfast Harbour, and after adjustment of compasses proceeded to Glasgow to take in bunker coal prior to running trials. The trial trip took place over the Skelmorlie measured mile on April 2nd, and after being put through a series of most exacting tests the various representatives of the owners expressed themselves as entirely satisfied with the ship in every respect. The average speed attained was 14¾ knots per hour, this being in excess of the guarantee. On completion of the Clyde trial trip the steamer headed for Belfast Lough at full speed, and after a most satisfactory run the representatives of the builders and owners were transferred to a tug boat in waiting, after which the *Abangarez* left for Central America. The vessel being intended to trade in tropical latitudes a unique system of ventilation has been introduced by the builders. Fresh air is passed and repassed over a series of coils containing brine circulation, which cools it most effectively and the air is then conveyed to the various decks and apartments by means of ducts, and each apartment is provided with small electric fans for freely circulating the air, so that passengers can regulate the temperature in their rooms according to their own ideas of comfort. During the severe tests which were made in the course of the trial trip of this important element in securing the comfort of passengers, it was found that when one stood in the state-room with the louvres fully open and the main fans doing their work the temperature was lowered to such an extent as to cause quite a chilly sensation.

Chira.—On April 1st, this vessel, which has been built by Messrs. Smith's Dock Co., Ltd., was taken for trial at sea, when she obtained a speed of nearly 9 knots on the measured mile. The vessel is 90 ft. long, 19 ft. breadth and 7 ft. 9 in. moulded depth. She is constructed to carry a deadweight of 100 tons, having a special tank for carrying oil in bulk. She is to the order of Messrs. Lane & Macandrew, on behalf of William Keswick, Esq., M.P., of Leadenhall Street, E.C., and was built under the supervision of Messrs. Flannery, Baggallay & Johnson, of London, Liverpool and Rotterdam, and is classed 100 A1 at Lloyd's. The engines are by the Shields Engineering Co., and the boiler is constructed by Messrs. Eltringham, of South Shields, and the vessel is fitted with electric light and towage appliances. She is also fitted for oil fuel and coal burning.

Teessider.—On April 1st, this vessel, which was recently launched by Irvine's Shipbuilding and Dry Docks Co., Ltd., from their harbour dockyard, West Hartlepool, went on her trial trip in a loaded condition, and after a very successful series of runs on the measured mile at Whitley Bay, was handed over to the Tyne-Tees Steam Shipping Co., Ltd., to immediately proceed on her service between the Tees and London. The vessel is beautifully modelled and her dimensions are 265 ft. by 35 ft. by 16 ft. 6 in. moulded, having a long poop extending beyond amidships and a topgallant forecastle 45 ft. long.

In order that this vessel should go through a thorough test and to the strict accordance with the contract, the *Teessider* was loaded with a general cargo at the company's wharf at Middlesbrough, together with her full complement of bunkers, so that she was practically put into the maximum service condition, being down to her load draught—about 1200 tons in all. The vessel proceeded to the Tyne, where a number of people were taken aboard, and was afterwards put on the mile at Whitley Bay. Under full steam she ran the mile with and against the tide six times, and the speed of the six runs resulted in a mean of 14 knots per hour, the maximum being 14½ knots, which was considered extremely satisfactory to all on board, and exceeding the contract by one knot at the maximum speed.

BOARD OF TRADE EXAMINATIONS.

NOTE—1C denotes First Class; 2C Second Class.

February 13th, 1909.

Ashbury, P. C.	2C	Liverpool
Barr, Geo. W.	1C	Hull
Boston, Robt...	1C	Greenock
Botts, G. H. A.	2C	Hull
Clark, Wm.....	1C	Dundee
Cowan, Wm. ..	1C	Liverpool
Davidson, J. W.	2C	N.Shields
Fleming, C. P.	2C	Dundee
Hughes, H. J...	2C	Liverpool
Lennox, J. W.	2C	Liverpool
Leslie, W. S. ..	1C	Dundee
M'Intyre, Jas.	2C	Greenock
Milne, G.......	2C	Greenock
Mitchell, John	2C	Greenock
Mollison, John	2C	Dundee
Morley, John H.	1C	Hull
Morris, John J	2C	Liverpool
Nilson, Alb. E.	2C	N Shields
Paisley, Peter ..	1C	Liverpool
Poyner, G. F. ..	2C	Liverpool
Pringle, John ..	2C	N.Shields
Rickinson, J. C.	2C	Hull
Robinson, Geo.	2C	Hull
Shuttleworth, W.	1C	N Shields
Storrie, T. A. ..	2C	Liverpool
Thirkell, C. H.	1C	N.Shields
Thompson, J. A.	1C	N.Shields
Tyre, Thos. D,	2C	Greenock
Wilson, Alb E.	2C	N.Shields
Wrigg, Benj. D.	2C	Liverpool
Yeates, Robert	2C	Barrow
Young, Robert	1C	Greenock

February 27th.

Barnett, W. J.	1C	Aberdeen
Bruce, Rich. R.	2C	Liverpool
Caswell, Lionel	2C	London
Charnock, John	1C	London
Cockrill, C. G.	2C	Hull
Cook, Cecil	2C	N Shields
Doig, William	1C	Aberdeen
Duncan, Andrew	2C	Liverpool
Fraser, Campbell	2C	N.Shields
Fraser, Jas. ..	2C	Greenock
Gardiner, W. C.	2C	Aberdeen
Gemmill H. ..	2C	Greenock
Gibson, T. S. ..	1C	Sunderl'd
Hart, Robt. H.	1C	Aberdeen
Howe, Robt. W.	1C	Sunderl'd
Jones, Robt. D.	2C	Liverpool
Kidd, John M.	1C	Aberdeen
Lawson, Wm...	2C	Sunderl'd
Lee, Alex. S. ..	1C	Greenock
Leeder, E. C. ..	2C	London
M'Arthur, J. M.	1C	Greenock
Maddison, Rbt.	1C	N.Shields
Martin, Arth. S.	1C	Aberdeen
Mason, Herbt. J.	1C	London
Millican, F. G.	1C	Sunderl'd
Mould, Frank..	1C	N.Shields
Munro, Alex. S.	1C	Greenock
Palmer, Alex. ..	1C	Aberdeen
Slater, N.......	2C	Bristol
Smith, John C.	1C	Greenock
Smith, Leslie ..	2C	Aberdeen
Snowden, Wm.	2C	N.Shields
Stoddart, Joseph	2C	N.Shields
Sutherland, H.A.	1C	Aberdeen
Sweeney, Geo.	1C	Liverpool
Taylor, B. H. ..	1C	London
Thompson, T.H.	2C	N.Shields
Tookey, A.W.B.	2C	London
Walker, Ed. R.	2C	N.Shields
Warren, John..	2C	Sunderl'd
Webb, Wm. R.	2C	Bristol
White, Chas. E.	1C	Hull
Winton, Ernest	2C	Sunderl'd
Wright, Herbt.	1C	Greenock
Young, David C.	2C	Aberdeen

March 6th.

Allen, James ..	2C	Belfast
Annett, Geo. L.	2C	South'ton
Barkell, Reg. F.	2C	South'ton
Barnes, Albt. E.	1C	South'ton
Barrie, Chas. S.	1C	Glasgow
Blackie, Rbt. G.	1C	Cardiff
Brand, Wm. ..	2C	Leith
Burn, Wm. H.	1C	N Shields
Cameron, W. F.	2C	London
Campbell, Geo.	1C	Glasgow
Campbell, Robt.	1C	Leith
Conroy, F. T. P.	2C	Cardiff
Cumming, J.H.	2C	Leith
Dickinson, W.H.	2C	N.Shields
Edwards, Thos.	2C	Cardiff
Evans, E. R. ..	1C	London
Evans, Wm. V.	1C	Cardiff
Frew, David ..	2C	Leith
Gilroy, Wm. ..	1C	Leith
Grant, John....	2C	Glasgow
Greig, Jas. P. ..	2C	Leith
Griffiths, J. D.	2C	Cardiff
Griffiths, W. G.	2C	Liverpool
Hamblin, Percy	2C	London
Harper, W. D.	1C	N Shields
Heron, Walter	2C	Liverpool
Hilton, John ..	1C	Liverpool
Holland, Fred..	2C	Leith
Hudson, Gilbert	2C	N.Shields
Jackson, Wm. J.	1C	Glasgow
Kerr, Thornton	2C	Liverpool
Lawrey, A. E.	2C	Falmouth
Legg, John G...	1C	Belfast
Little, William	2C	Liverpool
Loudon, John ..	2C	Leith
M'Lucas, J. D	2C	Glasgow
M'Niven, John	1C	Glasgow
Manganas, A. P.	2C	N.Shields
Martin, Arch....	2C	Glasgow
May, John G...	2C	Belfast
Murray, T. H.	2C	Glasgow
Nelson, W. J. C.	2C	Belfast
Norris, W. J. K.	1C	London
Quine, John L.	2C	Liverpool
Rendall, Robt.	2C	Leith
Richardson, W.	2C	Leith
Ritchie, John ..	2C	Leith
Robertson, J. C.	1C	Glasgow
Roch, F. J.....	2C	Falmouth
Scott, Donald..	2C	N.Shields
Selby, Thos. ..	1C	London
Sleigh, Edw. M.	1C	Liverpool
Smibert, John C.	1C	Leith
Smith, Frank A.	2C	Liverpool
Stevens, Wm...	2C	Glasgow
Sutton, Wm. E.	1C	South'ton
Symes, Robt. L.	2C	Glasgow
Thomas, C. G.	1C	Falmouth
Thomas, Tudor	2C	Cardiff
Thomson, Tom	1C	Glasgow
Turnbull, W. L.	2C	N.Shields
Tyler, Alfred J.	2C	Leith
Walker, Robt.	2C	Liverpool
Watkins, Henry	2C	Cardiff
Whyte, John ..	1C	Glasgow
Wilson, John ..	1C	Glasgow
Wylie, Rich. G.	1C	Liverpool

The Marine Engineer
And Naval Architect.
LONDON, JUNE, 1909.

S.S. "LAURENTIC."

THE first British steamer fitted with a combination of reciprocating and turbine engines was the s.s. *Otaki*, of the New Zealand Shipping Company, and it is very interesting that the return of this steamer from her first cargo-carrying voyage round the world, should coincide with the departure on her maiden voyage of the White Star Liner *Laurentic* to Canada. The results of the *Otaki* have been awaited with much interest, in order to decide the correctness or otherwise of views of eminent engineers and naval architects as to the wisdom of adopting the combined system of propulsion. This interest will now be enlarged in looking forward to the results of the *Laurentic*, which is the first passenger steamer fitted with the new arrangement. The time passes so quickly that it is difficult to realize that eleven years have gone by since the *Turbinia* was built by Mr. Parsons, and showed by really remarkable trials the marvellous possibilities of the true rotary engine. The principle has heen developed to a phenomenal extent as represented by the engines of the *Lusitania* and *Mauretania*, the latter vessel having made no less than eight consecutive voyages across the Atlantic at an average speed of no less than 25·36 knots. But it does not follow that what is desirable and efficient for one particular class of vessel is good for every vessel. The high efficiency of the multiple-expansion reciprocating engine is recognised by all, while for use in manœuvring the ship it is really the only simple and perfect means known of carrying out this necessary work in ship propulsion. At the same time one reasonably expects a good efficiency from the low-pressure turbine in using up the steam exhausted from the reciprocating engines. It would appear that the White Star Company are adopting the tactics of the Cunard Company, for as the *Carmania* and *Caronia* have appeared to act as the testing pioneers of the *Lusitania* and *Mauretania*, so the *Laurentic* and the *Megantic* will act in a similar capacity for two new 45,000 ton ships. There is no doubt that the policy adopted is a thoroughly sound one, preventing, as time has shown, any serious defect which might have arisen had no preliminary work been carried out in a question where wide departure from existing practice has been taken. We desire to congratulate the White Star Company on their enterprise, and to wish them every possible success in their laudable attempt to keep the British passenger lines well to the front in the world's competition. As our readers may, no doubt, be interested in the detail arrangements on the *Laurentic*, we give elsewhere a description and some illustrations of the vessel, and we shall look forward with much interest to the detailed information as to her performance which the White Star Company will, no doubt, issue at the earliest convenient opportunity.

MARINE SALVAGE.

IT is a matter of general surprise that in spite of the fact that over 50 per cent. of the mercantile marine of the world sails under the British flag, and it is a universally admitted fact that Great Britain is still the richest and most powerful of all maritime countries, so little enterprise is shown in the provision of salvage equipment, with the result that in all large salvage operations recourse must be had to foreign salvage companies. It is estimated that the probable average annual loss in ships and cargoes lost around the British Coast is somewhere in the region of ten million pounds, and in very few cases are the sunken vessels recovered. As time goes on one hears occasional protests made against the national indifference to sea salvage, or suggestions put forward for a state organization to reduce the enormous tribute paid to the sea by Great Britain. As was stated not long ago by the Master of the Rolls in the hearing of a wreck case, "It is of the highest importance to foster the maintenance of salvage vessels around our coasts," and in a recent case, Lord Gorell, in giving judgment, uttered words full of gravity and reproach to the British people, as follows: "It was a matter which struck me as most extraordinary, when the enormous volume of British Commerce which passed up and down these Coasts was taken into consideration, that there was no salvage craft belonging to British owners; it was, therefore, obvious that persons who launched in such enterprises of this character deserved to be adequately compensated." That the work is highly remunerative one may gather from the results given by foreign salvage companies; for example, one Swedish company during a short period of active existence has carried out operations which have resulted in the salving of vessels in their damaged condition, representing a value of over five and a half millions. Again, the firm of Baghino, of Genoa, received £52,000 for a few days' work on H.M.S. *Sultan*, though her promenade deck was barely under water, while when H.M.S. *Gladiator* was wrecked last year £50,000 was paid for raising her.

If one takes the latest statistics published, those for 1906-7, it will be found that the total number of vessels in the world reached over 47,000, of which about 15,300, with a tonnage of eighteen millions, sailed under the British flag. Of these 15,300, nearly 9,000 vessels, with a tonnage of seven and a half millions, suffered casualties. Ships of the Royal Navy are excluded from these figures, so that it will be seen that over half the ships and nearly half the tonnage belonging to the British Mercantile Marine reported casualties during the year, either at home or

abroad. Turning now closer home, what do we find as to wrecks round our home coasts? That no less than 3,784 ships had casualties, of which 453 were foreigners. It will be recognised that the value of the ships would be small in comparison to that of the cargoes lost, and for this reason the modest computation of loss of ten millions per annum is well within the probable figure. It is a matter of national concern that so much lethargy and want of enterprise is shown in tackling such an important question as salvage, and one is led to think that there are solid grounds for the repeated accusation that the British people are becoming less thrifty year by year, brought about by a spirit of *laisser faire*, which is a distinct sign of decadence of our national character. One hears so much nowadays of slackness of work, of difficulties of getting remunerative employment, and want of openings for the remunerative employment of capital. Surely we have in the salvage of marine property round our own coasts a fine field for operation, which, besides affording means for the utilisation of local industry, would avoid the payment of large sums out of the country to foreigners for supplying that which we ought ourselves to possess. There are many fields for exploitation in the world where the riches of the past lie buried in the depths of the sea, and it is conceivable that under proper conditions the harvest from well-thought-out operations would be very rich indeed.

INSTITUTE OF MARINE ENGINEERS.

James Adamson Testimonial.

We have received from Mr. P. T. Campbell, Convener of the Committee for the James Adamson Testimonial fund, copy of a circular that is being distributed to members of the Institute. There are few men better known to Marine Engineers than Mr. Adamson, who for twenty years has held the position of Honorary Secretary to the Institute.

As the Institute enters this season upon the twenty-first year of its existence, it has been considered that the time is appropriate for Members of all grades to be given an opportunity of showing their appreciation of the valuable work performed by the Honorary Secretary, in assisting to raise the Institute to its present position as an educative influence among, and a means of improving the status of, the Marine Engineers of this country.

The Institute was originally founded on the initiative of a number of professional gentlemen, and it now ranks amongst the leading Technical Institutions of the Kingdom, its published Transactions containing the results of experience and of original research in Marine Engineering of National and International importance. It is recognised that to a very considerable extent its success is due to the ability, untiring energy, and whole-hearted devotion of Mr. Adamson, who was elected Honorary Secretary at the first formal meeting of the Institute.

A Committee has been appointed to organise a fund for the purpose of presenting to Mr. Adamson some tangible and enduring evidence of the esteem in which he is held by Members of all grades. This, it is proposed, should be presented to him at the Annual Dinner, in October next, or on some other suitable occasion; and it is desired, also, in some approved way, to perpetuate his name and his efforts in the Institute.

Contributions should be sent to Mr. P. T. Campbell, at the Institute of Marine Engineers, 58, Romford Road, Stratford, E.

THE WORKMAN'S COMPENSATION ACT.

At the request of several of our subscribers, we republish from the pages of "The Scottish Law Review" of April, an article on the Workman's Compensation Act, which is worthy of perusal and will interest a large circle of our readers. If magistrates were to adopt the line pursued in a case which we saw recorded some months ago, it would be of very considerable service to the community. In the case in question the magistrate was satisfied that the solicitor representing the workman had instigated him to prosecute his employer for compensation beyond the bounds of moderation and justice, and the judge, in giving the finding, placed the costs upon the prosecuting solicitor. So may all such be served; it will prevent much evil and stop much wrong doing.

"This Act, originally devised by Mr. Chamberlain, will, unless materially altered, cause trouble and destitution, and throw out of employment a large number of hard-working and industrious men. Already it must have kept many thousand workmen in unemployment, and, unless its present terms are much altered, probably one-third of the workers in the country will be unable to find occupation. In the main the object which it seeks to attain is an excellent one. If a man is damaged at his work, and is thereby for a time rendered incapable of making his living, it is right and just that he should be maintained, in some measure at any rate, till he has recovered. The mistake has been that, instead of a national and compulsory system of insurance against injury, such as obtains in Germany, there is the liability of the individual employer; this, of course, means insurance. The insurance companies can make whatever terms they like, and they naturally must make the terms so stringent that an employer cannot take into his work anybody who is, to use a technical term, an under-average risk. The Act is bad alike for employer and employee. One employer of labour told the present writer that a few years ago he was able liberally to settle all compensation claims on an average of £500 a year, but that it now takes a matter of £2000. Of course, this simply means that he has to cut down his wage bill to the very lowest point he can by taking care that the wages are at a minimum, and that not a single superfluous hand is to be found in his works. Further, it means an increase of price to the buyer of his goods, so far as the market competition will allow of that.

We know that there is a general opinion that capitalists are fair game, but it is a wholly erroneous one. They supply, as it were, the fuel and the steam to the machinery, and if the fuel is scrimped the head of steam will be correspondingly lowered. A useful object-lesson is to be found in the amount of capital which has left the United Kingdom within recent years. It has gone to provide work for the foreigner. It has gone to help our rivals to compete successfully with us in the markets of the world. The amount of capital which has left the United Kingdom never to return is probably much greater than the whole of the money spent on the Boer war. No doubt that cost well above two hundred millions sterling, but, then, a large part of it came back in the pay of soldiers, or was retained in the United Kingdom for the payment of the munitions of war. A comparatively small sum was lost permanently. At present, however, capital is leaving the country permanently and soon the available amount of capital to foster British industry will be perceptibly and inconveniently less. One thing seems pretty clear; it is that, if the capitalist cannot use his capital to advantage in British industry, he will do it in foreign.

We are not however, specially interested in the British capitalist; for the most part, he can take care of himself. An important point for working men to determine is as to whether the capital which at present maintains British enterprise is to be used for that purpose or is to go to the foreigner. We are more concerned with the effect which compensation for injury has had upon the working man. To a large extent it has been most disastrous. A few concrete examples will make our meaning quite clear. They would be multiplied by hundreds, if not by thousands, if the tale of woe were fully known. They will suggest to all our readers who are even in the most trivial way acquainted with the conditions of labour many similar examples in their own experiences.

First, we know of one public work in which the employers have given the strictest injunctions that no one is to enter

their employment for the first time who is over forty years of age. Further, if a man has been in their employment, and from slackness of work they were compelled to dismiss him they have ordained that he is on no account to be re-engaged when times improve if he is fifty or over it. This firm happens to be their own insurers, and it is a mere matter of time till those firms which are insured with various companies will be compelled by their policies to make similar arrangements.

Second, the chief engineer of a steamer of 3600 tons register informed the writer that within the last nine months no fewer than six men had been put out of the stoke-hold of that ship on account of this Compensation Act. A shipping federation in which this boat was entered overhauled all the crew every time they were in a British port, and that had been the result, so far as the engine-room department was concerned. He was unable to give information as to what number of men had been discharged from the deck. Out of these six men one was discharged on account of weak eyesight. He had been many years in the employment, and had always seen perfectly well for the purpose of shovelling on coal. The sum in proportion is a simple one if the data be known. Supposing six men in nine months are put out of employment in one ship of 3600 tons, how many men will be thrown out of employment in a year in the British mercantile marine? The prospect of destitution, misery, and want which such a calculation brings to view is simply appalling. No wonder that in all our large towns the degrading misery and poverty so characteristic of our slums has enormously increased within the last few years. One of the saddest cases which we have come across is that of a man aged nearly sixty, who has spent the major portion of his life stoking a boat between the United Kingdom and New York a man of the most thorough respectablity, living frugally with his wife in one of our seaport towns. Much attached the two were to each other, and perhaps the only enjoyment and comfort in life which this worthy man had was the power of being able to return to his fireside regularly every month. One day he got a curt notice that his services were no longer required, and on inquiry he found that his age was such that the company with whom his employers were insured would not take the risk, and that the Workmen's Compensation Act had thrown him out of employment. There was no help for it; he had to go, and he is now engaged on a tramp steamer somewhere on the Far East, and will probably not see his fireside again for some years. It is a mere matter of time till the insurance companies insist that every person underwritten by them will be medically examined, and then all persons who have the slightest defect will be thrown out of work. What the condition of the country will be cannot well be imagined. The intention of the promoters of the bill was in the main good, but, as it has turned out, there never was a piece of more cruel legislation. Foreigners can be got to work in the stoke-holds at a much lower wage than the average Englishman or Scotsman, and, if the premium bears any relationship to the wage bill, they will invariably be preferred. As a matter of fact, in the specific instance of the ship of 3600 tons already mentioned, every place was supplied by a foreigner.

As we have already stated, it is in these respects a cruel piece of legislation. There has been nothing more cruel done in any civilized country in Europe, we believe, not even by the decree of the Czar of All the Russias. But there is another aspect of the Act almost as disastrous. It is playing havoc with the morals of the community. There is not a week passes but all through the country there are many cases of gross malingering. Hundreds of thousands of pounds must have been filched from the industrious, the hard-working, and the honest by the malingering blackguard in the last few years. Has it come to this in the United Kingdom of Great Britain and Ireland, that it no longer pays to be industrious and frugal and saving? Is all legislation to favour the spendthrift and the blackguard and the scoundrel at the expense of that remnant of the community which still possesses high character?

Those who find fault should suggest a remedy. In this case probably the best remedy would be to rescind these cruel enactments and start afresh on the German system. Short of that, however, some mitigation of the evil might be obtained by the passing of a contracting-out clause. At present every one who engages even a charwoman, and who is not insured, is practically running an unlimited liability company, and is in a dangerous position. With healthy people, no doubt, that risk may be covered by insurance, but before long it will be quite impossible to cover it for unhealthy persons, or, at any rate, for those who may be regarded as an under-average risk. What we suggest is that there should be an enactment terminating the liability in such cases at a year or six months. If something of that sort is not done, before very long thousands upon thousands of persons quite capable of earning their own livelihood, and more than anxious to do it, will be thrown out of employment and help to swell the mass of degradation and misery which is characteristic of British city life.

In one respect the Workmen's Compensation Act requires immediate revision, that is, as regards reference to a medical referee. To say the least of it, it is an invidious thing to refer a case from one medical man to another in the same district, and is an arrangement which can only be justified by the strongest possible reasons. Here is a case in point. Two surgeons were in practice in the same town, and to a certain extent in competition with each other; they certainly competed with each other in the way of teaching students. It is almost impossible to expect a perfectly disinterested opinion, under such circumstances, if the successful teacher has been a witness on one side and disagreed with the expert witness on the other side. For these and for similar reasons we think that, when in Court, medical experts differ from each other, the case on no account should be sent to a third medical expert in the same neighbourhood, but should be sent to one in another part of the country; for it is quite obvious that the third medical expert, if local, may be on better terms, or, at any rate, on less hostile terms, with one of the witnesses than the other.

It is even more important that the procedure under which references can only be made to one of the medical referees under the Act on the consent of both parties be at once abolished, for it is notorious that a workman or his solicitor will not agree to a remit to one of the medical referees in one case out of a hundred, and that for very good reasons. If the medical referee certifies the man is fit for his employment, the compensation is at once ended. On the other hand, if the employer has to petition for review, on account of the congestion of work in the Sheriff Courts generally, it may take months before the petition is heard, and workmen, who may have completely recovered from their injuries, are able, on account of this congestion, to continue getting payment of weekly compensation for weeks, and even months, after their incapacity has ceased. In the writer's opinion, the Legislature should allow a remit or remits to one of the medical referees under the Act, on the request of either the workman or the employer, at any time during the workman's alleged incapacity."

"SPECIALIST."

Standardization in Engineering Practice.—At the Institution of Engineers and Shipbuilders in Scotland, Glasgow, Professor W. C. Unwin lectured on "Standardization in Engineering Practice." In dealing with the investigations of the Standards Committee he said that the extent of which the standard specifications were accepted resulted in great unification and simplification. On the subject of making machine parts interchangeable, he said at first sight it might appear that it would increase the cost of manufacture. But it was not so. When proper appliances were provided, the cost of making parts accurate at first was less than the cost of making them inaccurate, and then adjusting them to fit. The first step to greater accuracy was to get rid of rough caliper measurements, and to have recourse to gauges and micrometers, and the final step was the use of so-called limit gauges. He discussed the various systems of screw threads, and said the time had come for standardizing for British practice such variety of screw threads as might be really necessary, but that would be useless unless means were also provided for the accurate production of screw threads conforming to standards, and being interchangeable. Standard gauges should be deposited at the National Physical Laboratory. To a certain extent standardization tended to check the making of incessant variations, some of which proved successful and survived. Standardization must be strictly limited to cases in which there was the least risk of stereotyping operations and designs. The decisions of the Standards Committee should be revised from time to time.

H.M.S. "SWIFT."

THE advent of the *Swift* marks the commencement of a new era in the design of torpedo-craft, just as the *Dreadnoughts* did as regards battleships, although in the case of destroyers the necessity for supreme qualities in speed and armament is not as acute as in the "capital" ship, where the limitation of numbers demands the quintessence of fighting and steaming powers in each individual unit. The *Swift* will not make all previous torpedo-craft obsolescent, but will certainly set the fashion in "destroyer-destroyers"—for this is undoubtedly what she is.

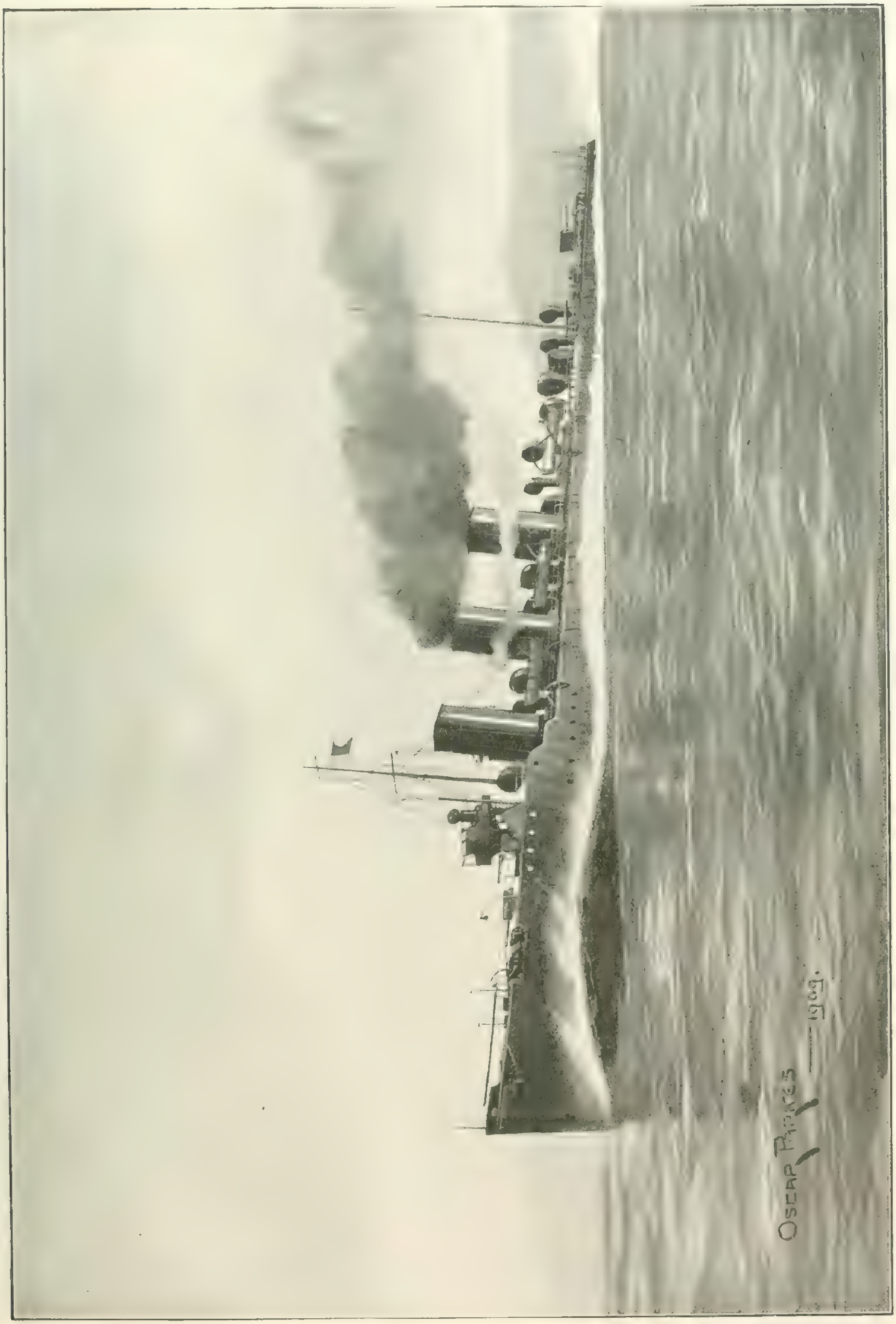
A brief review of the growth of the t.b.d. will show what immense strides have been made in the development of these craft. Commencing with our first actual "destroyer," the *Havock*, launched in 1893, we find that upon a displacement of 240 tons, an armament of one 12-pdr. and three 6-pdr. guns was carried, and with 3,500 i.h.p., a speed of 26·7 knots was recorded on trial. Eight boats of this class were constructed, which were followed in 1894-1895 by the *Ardent* class of 265 tons, 4,500 i.h.p., 27 knots, and an increase of two 6-pdr. guns over the preceding boats. Thirty-two of this class are still on the active list, but together with the earlier *Havocks* are almost worn out. From 1896 to 1901 we built sixty odd boats of the *Angler* type, which are generally known as the "30-knotters." Their displacements varied between 310-400 tons, all just touched their designed speed on trial, while the same armament was carried as in the *Ardents*. The *Express*, *Albatross*, *Arab* and *Velox*, which followed, all touched 31 knots, excepting the last, which was a general failure from the point of view of speed. The performances of the little yacht *Turbinia* had so demonstrated the properties of the Parsons turbine by this time that the ill-fated *Viper* and *Cobra* were built, these being the first war vessels to be fitted with this revolutionary type of machinery. The *Cobra* was the bigger, displacing 400 tons, and with 11,500 i.h.p. reached the record figure of 37 knots on trial—although designed for 31 knots only. Both had very short lives, the *Viper* running ashore and breaking up during manœuvres, while the *Cobra* broke her back during some heavy weather in the North Sea on her way from Elswick with a navigating party. Incidentally this latter catastrophe raised such an outcry against the alleged structural weaknesses of our destroyers that the next batch were of an entirely new design. Trial "fancy" speeds and light hulls made way for a reduced all-weather speed of 25 knots, while instead of the conventional "turtle-deck" forward the forecastle was built up similar to the old "torpedo-catchers," and although of practically the same length as the "30-knotters" (220 feet) the displacement was increased to 534-640 tons. In all thirty-three of the boats—known as the *River* class—were produced, while the original secondary armament of 5 6-pdrs. has been exchanged for 3 12-pdrs., making four of these guns in all. The *Garry* proved the fastest on trial, having reached 26·5 knots, but all can make their designed speed and have proved excellent sea boats.

From this point onward all torpedo craft were fitted with turbines, and in order to secure a very much higher speed coal-burning furnaces were abolished and only oil-fuel used. At the same time the demand for exceptional sea-keeping qualities postulated a greatly increased tonnage, and consequently the *Tribal* class of 1907-8 displace between 775-990 tons. The five *Afridis* carry three 12-pdr. guns only, have a designed power of 14,500, and on trial exceed the 33 knots required, the *Tartar* having reached 40·2 knots during recent Admiralty runs. The larger seven *Amazons*—not yet all launched—are 280 feet long, displace 880-990 tons, and with 15,500 i.h.p. should easily exceed the designed 33 knots. The new 4" gun replaces the 12-pdr., and two of these, together with some smaller weapons, form their offensive equipment.

This then is the tale of the destroyer up to the time the *Swift* comes on the scene. Displacements have risen from 240 to 990 tons, horse power from 3,500 to 15,500 and speed from 26·5 to 35 knots (omitting the *Tartar*). In 1906 it was decided to construct a vessel that would be able to overtake and destroy any contemporary or projected t.b.d. swiftly and surely. She was to be of *circa* 1,800 tons, carry four 4" guns and two torpedo-tubes, and able to steam 36 knots in a sea-way. Owing to the absence of available data for the design of such a vessel, and the stringent contract clauses should the full 36 knots fail to be reached, there was some little delay in placing the order, even the most experienced firms fought rather shy of it, but finally the *Swift's* construction was

TABLE OF CONTEMPORARY DESTROYERS.

		No.	Disp.	I.H.P.	Des. Speed.	Armament.	Launch.
England ..	.. *Swift*	1	1,825	30,000	36	4 4" + machine 2 T.T.	1907
	Amazon	7	890	15,500	33	2 4" 2 T.T.	1908
France ..	.. *Bouclier*	10	600	13,000	31	2 4", 4 9-pounders 3 T.T.	1909-10
Germany	.. *V 162*	12	616	12,000	30	2 23-pounders, 2 machine 3 T.T.	1908-09
Russia ..	.. *Okhotnik*	4	615	7,300	25½	2 4·7", 6 6-pounders 3 T.T.	1907
U S A. ..	.. *Joseph B. Smith* ..	5	700	10,000	28	5 14-pounders, 2 machine 3 T T	1909
Japan ..	.. New Boats ..	4	790	18,600	34	6 12-pounders 2 T.T.	1909
	"*A*"	1	1,150	20,500	35	2 4", 5 3" 3 T.T.	1909



H.M.S. "Swift."

entrusted to Messrs. Cammell, Laird & Co., Ltd., of Birkenhead, the contract price being about £250,000.

Built under the closest secrecy, she was launched in 1907 and commenced her trials last year. Her length is 345 feet, beam 34·25 feet, draught 10·5 feet and displacement 1,825 tons. Exact details of the results of the trials are wanting, but during recent runs she reached 38·3 knots, and now that alterations have been made in the shape and pitch of the screws, figures even better than the *Tartar's* are confidently expected. As may have been seen from our illustration, she is a remarkable-looking ship in her way, the nominal freeboard accentuating the great length and the three great funnels suggesting every unit of her gigantic horse-power, while the fitting of a main-mast —made necessary by the new high-power "wireless" rig—is a distinct departure in our Navy.

Regarding her internal arrangements little is known, except that the hull is sub-divided into innumerable water-tight compartments, so much so that, excepting from hits by big guns, she is practically unsinkable. This naturally raises the question as to what is the most suitable calibre for the secondary battery of battleships and cruisers to ward off vessels of her size. The 12-pounder is useless, so is the 4" gun which the *Superbs* and *Indomitables* carry. A table of contemporary destroyers, showing the great general increase in size from the time when the 12-pounder was an adequate anti-t.b. weapon is given.

Although of practical utility against small t.b.'s, the 4"-gun will be useless against a ship 25 feet longer than the cruiser *Arrogant*, which the *Swift* is; and so it seems that 5" and 6" guns will have to be re-introduced as purely anti-t.b. guns, apart from any question as to their utility in general ship-to-ship action. The Japanese still retain both 4·7" and 6" guns, the Americans are mounting 5" weapons in the *Delawares*, while the new German *Nassau* class are reported to carry 6·7" guns as secondary armament. Hence the advisability of introducing a new-calibre gun into the service—something that can loose off fourteen rounds a minute, worked by manual labour, and firing a projectile heavy enough to settle the hash of boats like the *Swift*. The 5" seems certainly the most suitable as yet, and we sincerely hope our newest ships will not be fitted with 4·7" or smaller guns, and so be practically at the mercy of the new huge destroyers. The proposal to use big shrapnel against torpedo craft suggests perhaps the best way out of the difficulty, as this would tell with devastating effect against both the *personnel* and tea-tray sides of the t.b.d. Certainly used in conjunction with 5" fire the destruction of the attacking vessel would be assured.

As regards the multiplication of the type, the great cost must not be held to militate against numbers. Two distinct types of destroyers are needed—one the new "27-knotters," for fleet protection and attack and harbour defence; the other the *Swift*, for hunting down opposing craft and scouting. A great many of the former will be required, but comparatively few of the latter—a ratio of 4 : 7 approximately.

The *Swift* is as yet the sole unit of her type.

DREDGER FOR SINGAPORE.—Messrs. Wm. Simons & Co., Ltd., Renfrew, have received an order from Messrs. Sir John Jackson, Ltd., the well-known contractors, for a bow-well barge-loading bucket dredger, to be employed in carrying out important improvements at Singapore.

THE SCIENTIFIC EDUCATION OF NAVAL ARCHITECTS.*

By Prof. J. J. Welch, M.Sc., Member of Council.

IN view of the important papers on the general subject of engineering training and education which have been read in recent years before this Institution, it is with some diffidence I venture to ask your attention to another paper of similar type, particularly as, since I promised our President a paper with this title, Sir W. H. White, in his capacity as Chairman of Council of the Royal Society of Arts, took the same subject for his address. However, it will be treated from a somewhat different point of view and will, I trust, be found a not uninteresting story of progress.

My purpose in this paper is to review what has been done in the past to ensure the thorough training of the British naval architect in the highest branches of his profession; and as the Government were the pioneers in this matter, it is to the Admiralty systems that my remarks will be chiefly devoted. Whilst, however, the paper deals mainly with the history of the subject, I am not without hope that past experience will be found to suggest a wider adoption of proved successful methods to meet present-day requirements.

There is a certain fitness in making a review at the present time, since it is practically one hundred years ago that the subject indicated was taken up in real earnest in this country, and we are able, therefore, to gauge the progress made during the intervening century.

At the outset, it may be remarked that so long ago as 1610 we have indications that science was not wholly divorced from ship designing and shipbuilding, for in that year Phineas Pett, a master shipwright, and also Master of Arts of Emmanuel College, Cambridge, designed the *Prince Royal*, which proved a great advance on types hitherto built; whilst in 1637 his more famous *Sovereign of the Seas* was launched. It is interesting to remember that most of the oak used for the last-named vessel was grown in this district at Chopwell. Sir Anthony Deane, too, was another noted designer of the seventeenth century and the diarist Evelyn records, under date 1681-2, that "Mr. Pepys, late Secretary to the Admiralty, showed me a large folio containing the whole mechanic part and art of building royal ships and men of warr made by Sir Anthony Deane, being so accurate a piece from the very Keele to ye lead block, rigging, gunns, victualling, manning, and even to every individual pin and naile in a method so astounding and curious with the draught both geometrical and in perspective, and several sections, that I do not think the world can show the like. I esteem this booke as an extraordinary jewell." Pepys, too, states that Sir Anthony "is the first that has come to any certainty beforehand of foretelling the draught of water of a ship before she be launched." That is to say, he could make an estimate of launching weight for a new ship, and of the volume of displacement to a given waterline, this being the first recorded instance of the direct application of science to naval architecture. Some drawings by Vandevelde in the possession of Armstrong College—kindly presented by the Earl of Carlisle—well illustrate the care lavished upon the vessels of this period to make them externally things of artistic beauty. The fame, indeed, of British shipbuilding towards the end of the seventeenth century was such that Peter the Great on his first Continental visit was attracted to Deptford Dockyard, and for a few months in 1798 he worked there as a shipwright.

In the eighteenth century, however, the condition of affairs was much less satisfactory, and whilst our neighbours across the English Channel were calling to the aid of their shipbuilders some of the best known mathematicians and scientists, there prevailed in this country almost complete apathy with reference to this important matter. It is not, therefore, surprising that when, early in the nineteenth century, the Commissioners appointed "for revising the Civil affairs of the Navy" came to issue their report, that portion of it (issued in 1808) which dealt with naval architecture revealed the very unsatisfactory position of this country in this respect, as sufficiently indicated by the following extracts :—

* Read before the North-East Coast Institution of Engineers and Shipbuilders, Newcastle-upon-Tyne.

"We find that apprentices are admitted at the age of fourteen; that at their admission many of them cannot read or write; few have much education; they are examined previously to their being entered, but their examination seems prnicipally confined to their being of the age mentioned, to their being four feet ten inches high, and found by the surgeon in good health. As apprentices they serve seven years; no care is taken to teach them anything during that time but their business as shipwrights. Some of them are, it is true, employed in the cabins and mould lofts, and of these a part is said to be chosen on account of merit, and a part from the favour or partiality of the officers. At the end of the apprenticeship they generally serve two or three years, working as shipwrights, after which time those reckoned fit for it are commonly employed as overseers of ships building in the merchants' yards; they are then appointed quartermen, having the superintendence of fifteen shipwrights and four or five apprentices, from which situation they are raised in succession to those of foreman, assistant to the master shipwright, and to that of master shipwright, from which employment the Surveyors of the Navy are chosen. In the whole course we have described, no opportunity will be found of acquiring even the common education given to men of their rank in life, and they rise to the complete direction of the construction of ships, on which the safety of the empire depends, without any care or provision having been taken, on the part of the public, that they should have any instruction in mathematics, mechanics, or in the science or theory of marine architecture." Further on they say: "We believe the representation we have given of the education of shipwrights, as matters are at present carried on, to be correct; it can scarcely be necessary to add that, unless this part of the present system shall be altered, even good working shipwrights will hardly be found in our dockyards; and it would be in vain to expect order or regularity in the conduct of the business, accuracy in the accounts, or professional skill in those who must, at no great distance of time, come, of course, to be entrusted with the management of everything respecting the construction of the ships by which this country is to be defended." They also say: "Whenever our builders have been so far misled by their little attainments in the science of naval architecture to depart from the model before them in any material degree, and attempt improvements, the true principles on which ships ought to be constructed, being imperfectly known to them, have been mistaken or counteracted, and the alterations, according to the information given us, have in many cases done harm. . . . The alterations being founded on no certain principles, no similarity in the forms of ships could be expected, and they have the appearance of being constructed on the chance that, in the multitude of trials made, someone might be found of superior excellence. While, therefore, our rivals in naval power were employing men of the greatest talent and most extensive acquirements to call in the aid of science for improving the construction of ships, we have contented ourselves with groping in the dark in quest of such discoveries as chance might throw in our way. But where we have built exactly after the form of the best of the French ships that we have taken, thus adding our dexterity in building to their knowledge of theory, the ships, it is generally allowed, have been the best in the Navy." It is well known, too, that our captures from the French immediately took their place in our Navy as the best in their respective classes, whilst those captured from us by the French were, if utilised at all, relegated to an inferior class in their Navy.

To remedy this state of affairs the Commissioners recommended the entry at Portsmouth dockyard of a superior class of apprentices, who should have the privilege of study at the Naval Academy (established in 1729 for young naval officers; its name was subsequently altered to Royal Naval College and the present Royal Naval College at Greenwich is its direct descendant) as well as the advantage of instruction in the practical part of their profession. The principal recommendations of the Commissioners are set out in the appendix (I.), and it will be agreed, I think, that they laid broad and deep the foundations for an excellent scientific education. These recommendations were adopted almost in their entirety; the Rev. Professor Inman, a graduate of Cambridge University, was placed in charge of the new department, and the first examination for entry was conducted in 1810, and as a result, twelve students of naval architecture commenced their course at Portsmouth in January, 1811. From the beginning, however, one of the recommendations was not acted upon, *viz.*, that relating to the subdivision of the work in each day, but, instead, the first three days in each week throughout the apprenticeship were devoted to mathematics, drawing and French (except that when efficiency was gained in French its place in the time-table was taken by ship drawing), whilst the last three were utilised for instruction in actual shipbuilding. It was soon found, too, that the officers of the dockyard could not give the necessary attention to these students and a special officer, Mr. Fincham, was appointed as instructor in actual shipbuilding, drawing, laying-off, etc. Nor was any attempt made to carry out the recommendation of the Commissioners that these superior apprentices should be excused the heaviest kind of labour, as, to quote Dr. Inman, "It was thought best to make them perform every part of a shipwright's duty well with their own hands." A further recommendation was not carried out in practice, as students were not sent to sea during their apprenticeship, but a few of these obtained sea experience after they had filled positions in the royal dockyards for some time.

As to their general studies, Dr Inman reported that when the students had gone through a proper preparatory course of algebra, geometry, trigonometry, mechanics, hydrostatics, and the differential and integral calculus, they then began a strictly professional course of reading in the theory of naval architecture, taking as text books Chapman's Swedish work, the English treatise on the stability of ships by Atwood, and, subsequently, treatises on building, mast-making, etc., by Fincham.

After excellent work, this first school of naval architecture was abolished in 1832 by Sir James Graham, the then First Lord of the Admiralty, from motives of economy. About forty students had graduated and the total cost to the country had been £50,000, of which nearly one half was for buildings and furniture. Amongst the graduates of this school may be mentioned Mr. G. Moorson, of tonnage fame; Isaac Watts, who finally became Chief Constructor of the Navy; Messrs. Read, Chatfield and Creuze, of whom the last-named eventually became Chief Surveyor to Lloyd's Register, and Thomas Lloyd, who became Engineer in Chief to the Navy.

No school of naval architecture existed for sixteen years, but in 1848 the Central School of Mathematics and Naval Construction was established at Portsmouth, with Dr. Woolley, a graduate of Cambridge University, as Principal.

This second school obtained its supply of students from the several dockyard schools; these had been introduced in 1843, and all the apprentices were required to attend them for a portion of the time during the first three years. At the end of this time some of the apprentices were selected by examination for two years' further instruction in more advanced subjects, and then the best of these at the end of this additional course were selected by examination and sent for further training to the Central School of Mathematics and Naval Construction. This school existed for five years only, being abolished by Sir James Graham, who had again come into power and presumably had a poor opinion of the value of a scientific training. In that short time, however, good work was done, and several of the students of this school subsequently became famous, amongst whom may be mentioned Sir E. J. Reed, Sir Nathaniel Barnaby and Mr. F. K. Barnes.

The several dockyard schools have had a continuous history from 1843 to the present time and have done exceptionally good work. For an account of the subjects now taught, see Mr. B. C. Law's paper on "Technical Education," in Vol. XX. of our *Transactions*.

It may be mentioned here that the merit of the scientifically trained men did not meet with immediate recognition by their superior officers in the dockyards, who had had a practical training only; and many years elapsed before the graduates had an opportunity of showing their quality in responsible positions. The highest position, indeed, to which these men had been encouraged to aspire, the Surveyorship of the Navy (corresponding to that of the present Director of Naval Construction), was held for many years by a naval officer who had had no scientific training as a naval architect. When, however, large departures from existing practice had to be made and precedents were no longer available, it was felt to be imperative that the highly-trained men should occupy the responsible positions, and thus during the changes

from sail to steam power and the changes necessitated by the adoption of armour and substitution of iron for wood as a shipbuilding material, men like Isaac Watts, Thomas Lloyd, E. J. Reed and Nathaniel Barnaby came into their own, and brilliantly vindicated the system under which they had been trained.

For several years following 1853 no school of naval architecture existed, and Scott Russell drew attention to this fact in a forceful paper read in 1863 before the then newly-formed Institution of Naval Architects. After pointing out that, "in England we have at the present moment professional science and education expelled from the Navy and (referring to a collection of models) professional precedents and principles locked up in a cellar of Somerset House," he proceeded to contrast the condition of affairs in France, which possessed an excellent school of naval architecture in Paris. He pointed out that "so great is the demand for these trained naval architects and so highly are they valued that they can hardly be permitted to complete their third year of instruction, so great is the demand for their practical services in the dockyards; and not merely in the dockyards, but their best pupils are to be found managing the largest and most prosperous engineering and shipbuilding establishments of France." Scott Russell further mentioned that in consequence of the absence of any English school he and Mr. Laird, of Birkenhead, had been reluctantly compelled to send their sons to France in order that they might receive adequate training in the science of naval architecture. He advocated the establishment, under the auspices of the Institution, of a school to which he hoped the Admiralty would send pupils, whilst private shipbuilders and marine engineers would, it was believed, send for training selected men from their own yards and works.

This paper, backed up as it was by the Institution as a whole, led to immediate action and in 1864 the Royal School of Naval Architecture and Marine Engineering was founded at South Kensington under the joint responsibility of the Admiralty and Education departments, and was accessible to private students.

It will be noticed that the idea underlying the working of the first school was to provide from the beginning apprentices drawn from a superior class to that from which the ordinary apprentice was taken, and to train them for the higher professional offices, leaving the subordinate offices to be filled by men from the ordinary apprentice class. On the other hand, the second school gave an equal chance to all its apprentices to reach the highest positions, and this method was followed in the third school, so far as Admiralty students were concerned. The best of the dockyard apprentices who had during four (or sometimes five) years been employed in actual shipbuilding, and had also been instructed at the dockyard schools on stated afternoons and evenings of each week in mathematics, chemistry, physics, etc., were selected by examination and sent to South Kensington. The course there continued over four sessions of seven months each, and comprised instruction in higher mathematics, practical chemistry, physics, applied mechanics, metallurgy, as well as special instruction in ship calculation and design. The remaining five months in each year were spent by these students in the dockyards, noting details and methods of work in diaries which were afterwards transmitted to the Admiralty for examination.

This third school of naval architecture remained at South Kensington for nine years, and those trained during that time include the late Dr. F. Elgar, Sir W. H. White, Sir P. Watts, Mr. J. R. Perrett, of Messrs. Armstrong, Whitworth and Co., and Mr. S. J. P. Thearle, whose promotion to the Chief Shipwright Surveyorship of Lloyd's Register in succession to Mr. Cornish has been recently announced. In 1873 the Admiralty transferred their own students to the Royal Naval College, then established at Greenwich, and this continues to be the final training college for Admiralty naval architects and marine engineers. The South Kensington school had not been taken adequate advantage of by private students, and was therefore closed when the Government removed their own students to Greenwich. The course at the last-named place consists of three sessions of nine months each, two vacations of three months each being spent at the dockyards, noting particulars as already mentioned. The teaching at Greenwich followed, in the main, on the lines inaugurated at South Kensington and gave excellent results; nearly all the members of the Royal Corps of Naval Constructors are past students of the Royal Naval College, whilst others who left the Admiralty service are occupying good positions outside.

In recent years a change was made in the method of selecting Admiralty naval architecture students for the Royal Naval College, two sources of supply being then depended upon, one of these being the Royal Naval Engineering College at Keyham. Certain of the engineering cadets who at the end of their second year showed special ability were allowed to transfer to naval construction cadets, and to receive during the remainder of their time at Keyham instruction in the practical part of their profession in addition to their general scientific training. After five years these cadets, on passing a satisfactory examination, went to the Royal Naval College as probationary assistant constructors. The dockyard apprentices still constituted, however, a possible further source of supply, and those who at the end of their fourth year were adjudged to have done sufficiently well were given cadetships in naval construction and proceeded to Keyham for a year's further instruction, at the end of which time they also went to Greenwich as probationary assistant constructors if they passed the prescribed examination. A way was thus kept open by which apprentices of exceptional ability might reach the highest professional posts in the Admiralty service. In consequence of the new system of training for naval officers, Keyham is no longer available as a source of supply, and thus at the present time the required Admiralty students of Naval Construction are drawn entirely from the dockyard apprentices.

Reviewing, therefore, the Government policy for the last hundred years, it is seen that, with the exception of the lapses named, they have given their naval architects the highest available professional training; and the present position of British warship building and design is surely eloquent testimony to the wisdom of the course pursued.

Turning now to schools of naval architecture unconnected with the Admiralty service, a chair of naval architecture was founded at Glasgow University in 1883, the late Dr. Elgar being appointed first Professor. He was succeeded by Mr. Philip Jenkins, and after the death of the last-named, Professor Biles was appointed to the vacant post; all these gentlemen were graduates of the South Kensington or Greenwich school, and the good work done by them at Glasgow is well known.

In 1906, a similar chair was founded in our own city at Armstrong College, in connection with Durham University; and perhaps I may be permitted to give a slight sketch of the course of study pursued at this centre by naval architects proceeding to the B.Sc. degree. All such students must, as a preliminary, have passed the Durham Matriculation Examination, or one equivalent thereto, with certain special requirements in mathematics; and their subsequent course at the college may be completed in three sessions, each consisting of three terms of about three months each. During the first year they receive a training common to all science students and subsequently obtain special instruction in their own and related subjects. In the first year they take mathematics, also physics and chemistry (with laboratory work in each subject) and mechanical drawing. During the second year attention is devoted to higher mathematics, to lectures on naval architecture, and to ship drawing and calculation; to lectures on applied mechanics and engineering laboratory work, and to mechanical drawing. The third year curriculum includes more advanced instruction in naval architecture and further work in the drawing office connected with ship drawing, calculation and design; additional mathematics; further physics lectures and physical laboratory work; and lectures on engineering subjects with practical work in the laboratory. The teaching under each of these heads is very thorough, and the scope as regards naval architecture is indicated in the appendix (II.), which closely approximates in general outline to the course of instruction given by me as Instructor at the Royal Naval College, amplified as required to deal with later developments.

A B.Sc. of not less than two years' standing as such can make application to be examined for the M.Sc. degree, and a Master of Science of not less than seven years' standing from admission to the B.Sc. degree is allowed to become a candidate for the degree of Doctor of Science: this degree is given for special distinction in original work or learning.

Many of our students have a considerable knowledge of the practical side of their profession before joining, and return to shipyard work during the summer vacations, thus carrying out the "sandwich" system of training which has been characteristic of Admiralty methods for many years. Others, mainly foreign students, join without previous experience in a shipyard, and commence their apprenticeship either during, or subsequent to, their period of college training.

In addition to the complete scheme of study above outlined, provision is made at the College for Diploma courses extending over two or three years. These are intended for those students who feel that their mathematical and other attainments preclude their taking the more advanced work.

The special scholarships associated with this department are the three given by Lloyd's Register of Shipping, and that provided by the Worshipful Company of Shipwrights. The former are entrance scholarships, each of the value of £50 per year and tenable for three years; two of these have already been awarded, whilst the third falls to be competed for at the beginning of next session; and one will, of course, be available for competition each year. The Shipwrights Company mentioned gave last year a scholarship of £25 to be competed for by students of naval architecture taking the complete College course; this year, I am glad to say, its value has been increased to £50, an amount which is in addition to the £25 generously given from the same source for prizes to the most deserving students in the evening classes.

From the foregoing it will be seen that there is in operation in this district a scheme of education for naval architects similar to that which has proved eminently successful in the case of Government students; and I hope this paper will be instrumental in drawing the attention of shipbuilders, parents and others interested to the facilities here provided.

I note from the public press that £12,500 has recently been presented to Liverpool University to assist in founding a Professorship of Naval Architecture, so it is possible that in the near future there may be three schools of naval architecture in this country outside the Government establishment.

The number of students receiving the highest professional training in this country is small compared with the number receiving similar instruction abroad, a fact viewed with some concern by those anxious for the continued pre-eminence of this country as a shipbuilding centre. I had the opportunity a few months ago of seeing what was done at Charlottenburg: and also had the pleasure of meeting Professor Lorenz of Danzig, who told me of the progress made in their naval architecture classes since their establishment in October, 1904. In these two German schools there were during the session 1907-8 no less than 280 students taking naval architecture courses, *viz.*, 200 at Charlottenburg and eighty at Danzig. In the United States, too, there were at the same period a total of ninety-two students in the Massachusetts Institute of Technology, the University of Michigan, and Cornell University, the three establishments for which I have details; whilst smaller classes of similar type were in existence at other centres. When we remember that the total number of students attending British schools, including the Government establishment, was less than that given for the United States and less than one-half the number in Charlottenburg, we are forced to conclude that in this country less importance is attached to a sound scientific education than in the other countries mentioned; and this in spite of the fact that the call for such men should be greater here where the amount of shipbuilding is from two to three times the total for the other two countries named.

In these days of constant change, not to advance is to fall behind, and there is a distinct risk lest in this matter we allow others to gain upon us to the endangering of our present supremacy. From the point of view of the employer it seems most desirable to widen the area of education as much as possible so as to discover the very best brains to carry on the work in the more important positions; whilst raising the standard of those occupying the less responsible posts will also result in much gain to the employer, since work will be done more intelligently and with better appreciation of what is required. It cannot be gainsaid that the shipbuilding industry demands the best science it is possible to get, and the necessary additional cost of the more highly trained man is money well expended.

I have been constrained to ask myself whether an extension to mercantile practice, on a larger scale than hitherto attempted, of the Admiralty methods of assisting deserving apprentices, would not be followed by like beneficial results. We have in this country evening classes connected with the Board of Education in which most excellent work is being done, as I had exceptional opportunities of judging when for some years I held the post of an examiner to that Department. These classes perform a somewhat similar function, as regards the training of apprentices, to that of the dockyard schools, and should serve to discover promising pupils. Mr. Spence, in the excellent paper read last year, said that "the chief business of evening classes should not be the production of a light crop over a large area, but rather the giving of assistance enabling a few to raise themselves above the average and to pass on to further advancement. My belief is that when exceptional students have been thus discovered, it would be a wise policy on the part of their employers to afford them such financial and other facilities as would enable them to attend the day classes at the nearest technical college, following, if need be, the Admiralty practice of requiring such apprentices to serve the firm for a stated number of years, after the completion of their apprenticeship. As an Institution you have already done something in this direction by providing a scholarship to be held by engineering and naval architecture students alternately, and I believe that the originators are hopeful that the number of scholarships will be gradually increased; this, if found possible, will be of distinct service to the district.

In the main, however, we must, I am convinced, look increasingly for the supply of principal officers for the great mercantile establishments to the men who, after a good public school training, have received further education at one of the University Colleges, and I am glad to say that some shipbuilders in this district have notified me of their intention to avail themselves, as far as possible, of the services of those who have passed through the complete course at Armstrong College. In this connection, indeed, nothing further is wanted than the adoption by shipbuilders in general of the excellent pupilage scheme formulated by the Education Committee of this Institution, and their encouragement of those who take the University training after their term of apprenticeship. By the alternative systems of training recommended by the Committee, the theoretical and practical portions may be judiciously blended, and the young men thus equipped will be able to take fullest advantage of their opportunities, to the benefit of employer and employed.

I have dealt with this large subject in a very inadequate and fragmentary manner, but this review will serve a useful purpose if it directs renewed attention to the important question of the adequate training of naval architects for mercantile purposes, for only by taking the utmost advantage of our opportunities will it be possible, in these days of keen competition amongst nations, for British shipbuilding to retain the proud position it has so long occupied.

The appendixes are not reprinted. They are:—

APPENDIX I.—Extracts from Report of Commissioners for revising the Civil Affairs of the Navy in 1806. Plan of education proposed for apprentices. Superior Class of apprentices.

APPENDIX II.—Armstrong College Syllabus of Lectures on Naval Architecture and Details of Class Work.

MESSRS. JOHN I. THORNYCROFT & CO., LTD.—We have received the following notice from Messrs. Thornycroft and Co., Ltd.:—You may have noticed the report in the press recently as to our closing down our Chiswick premises. This report is somewhat misleading, and has caused us inconvenience by reason of the fact that it infers that the whole of our Chiswick premises will be disposed of by us. As a matter of fact, we are retaining a considerable portion, which it is proposed to thoroughly equip as a repair depot for both cars and vehicles and a garage. It will also serve as a London depot for our demonstration cars and vehicles.

The Clyde Shipping Company.—The Clyde Shipping Company have issued an attractive handbook giving particulars of their passenger service, with special reference to holiday tours to various parts of the British Isles. A new feature of the company's sailings this season is a trip round Ireland. This affords an opportunity for a five days' sea holiday.

KLINGER'S MARINE LUBRICATOR.

MECHANICAL automatic lubrication has forged its way to the front, and is now recognised as a necessity in connection with sea-going engines, but any device for this purpose must be capable of continuous working over long-extended periods and able to carry out its function with reliability and absolute precision.

Messrs. Richard Klinger and Company, of 66, Fenchurch Street, London, E.C., have made such a mechanical lubrication specialty, and we have much pleasure in presenting to our readers a description and illustrations of one of their special type of marine lubricators.

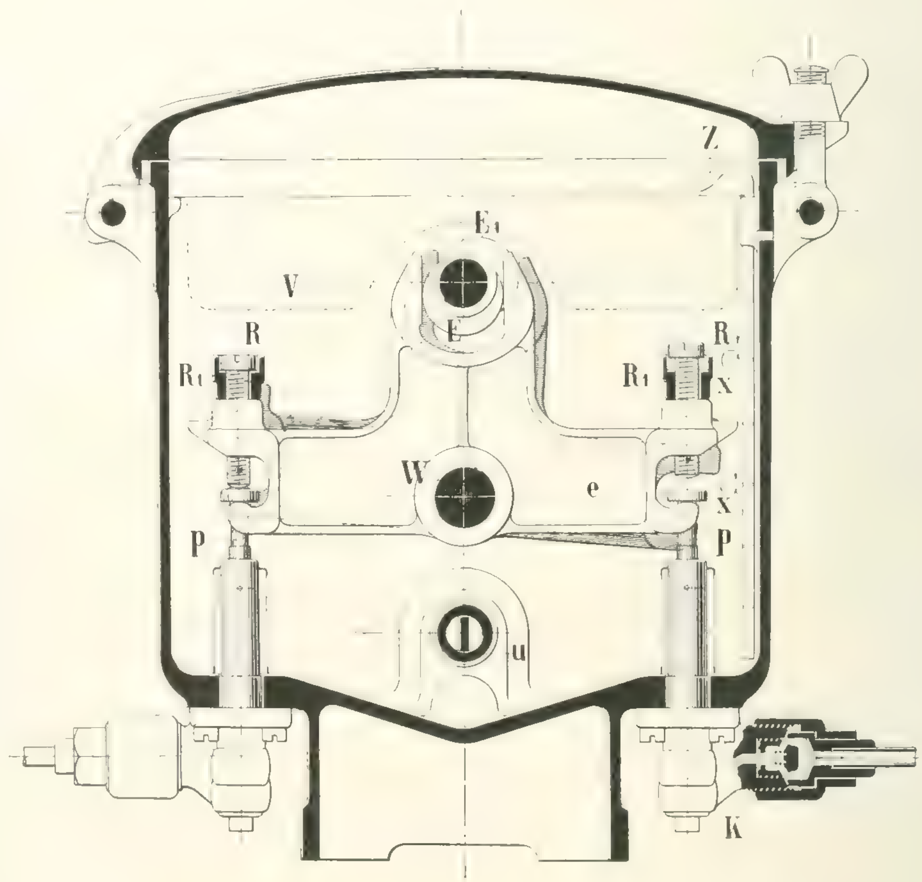
This apparatus is a combination, in one casing, of a series of oil-pumps, each working independently and automatically, and forcing forward with unerring precision and regularity the exact quantity of oil for which it is actually adjusted. It will work against enormous pressure without affecting its steady and reliable action, and one lubricator may, therefore, be employed for the simultaneous oiling of any number of parts under varying pressures or free from pressure — such as stuffing-boxes, for example.

The oil-feed to each outlet is effected by two plungers, working in separate cylinder chambers. One of these forms the distributing plunger *q* and the other the pressure plunger *p*. These receive their movement from the angle levers *e*, operated by the double eccentric $E\ E_1$, and the motion of each pair of plungers is practically alternate and so arranged that the compression chamber can never be in direct communication with the oil reservoir.

The oil passes from the oil reservoir through the opening *o*. The downward pressure of the distributing plunger *q* brings the oil down to the first cross-channel *y*, through which it readily escapes into the space below the pressure plunger *p*. The downward motion of this forces the oil through the lower cross-channel y_1 into the compression chamber *K*, where it again comes into contact with the distributing plunger *q*, but at the lower end. This action causes a regular feed of oil along the tubes to the point to be lubricated, and the plungers keep perfectly tight against pressures of 750 lbs. and upwards for years. Even after as many as ten million strokes have been registered, no variation whatever has taken place in the delivery to the spots to be lubricated.

The purpose of the small spherical valve, next to the compression chamber *K*, is solely to free the cylinder chambers, during those phases of movement when no oil is being fed forward, from any counter-pressure. In this way the wear and tear of the plungers and cylinders is reduced to the minimum.

The quantity of oil sent forward by the whole of the plungers depends, firstly, upon the number of revolutions made by the eccentric shaft *D*, which is made to rotate in the usual manner by the forward and backward movement of the lever arm *L*, which actuates an intermittent roller-gear on the shaft. Hence by altering the angle of deflection of the lever



arm *L* the entire feed quantity may be increased or decreased as required.

Furthermore, each oil outlet can be regulated individually. As the quantity sent forward to each outlet depends upon the throw of its own pressure plunger *p*, it can be correspondingly diminished by reducing its throw. The stroke of this plunger *p* can be reduced by screwing up the adjustment screws *R*, which are then fixed in position by means of the nuts R_1.

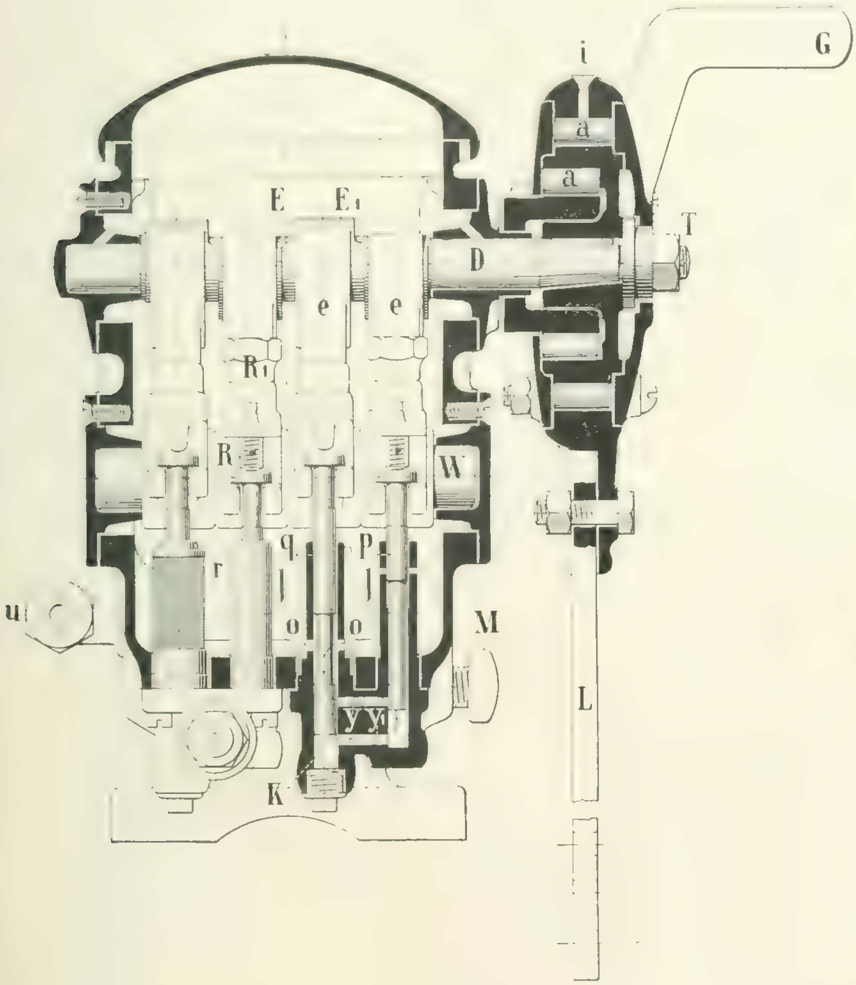
On filling the reservoir the oil passes first through the upper sieve *V* which covers all the internal mechanism. Still finer sieves *r*, cylindrical in shape,

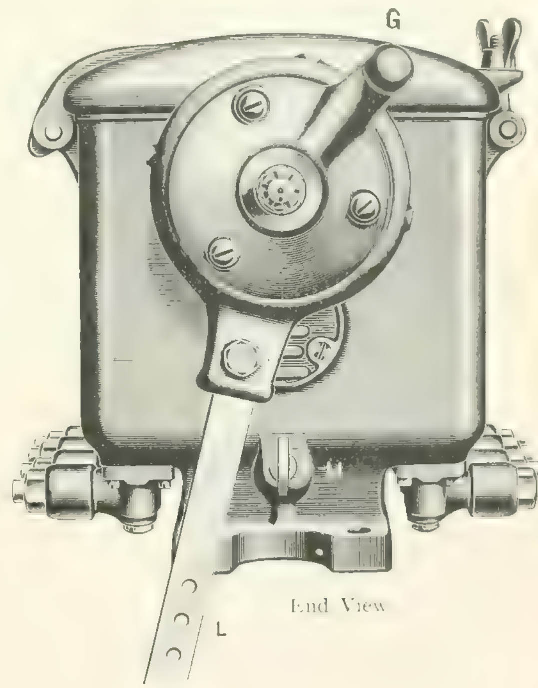
are placed round the plunger casings so that the oil is freed from all impurities before it reaches the pipes—a very important advantage which assures the proper working of the apparatus without clogging.

The screw *M* permits of the reservoir being emptied when necessary, and is also a means for determining whether any water has collected in the oil reservoir.

A wire rod *Z*, which can be withdrawn, serves to discover the height of the oil in the reservoir.

When the lubricant employed is of a viscid nature, the oil in the reservoir must be warmed. For this





purpose the go-and-return steam channel or pipe *u* runs well to the middle of the oil reservoir. This heating, however, should not be excessive.

The only attention required is filling the reservoir from time to time. All the inside mechanism runs in the oil, so that only the ratchet or roller-gear requires oiling through the hole *i* with thin machine oil about three or four times a week. After every pause of more than one hour it is advisable to give the eccentric shaft nine to ten turns by means of the handle *G* in order to deliver an extra quantity of the oil to the various parts.

THE FLEETS OF THE MAIL LINES.

(From our Own Correspondent.)

An Announcement of Great Interest.

to most of our readers is that by the Anchor Line to the effect that they are about to build another express steamer for their Glasgow and New York trade. It is not so much the size or speed of the intended vessel that will appeal to them—for the new ship will not be very large, or even very speedy as mail steamers go to-day. But she will complete the evenly balanced quartet with which the company will be able to maintain their weekly despatches across the Atlantic with vessels of similar speed and character. This is a thing, which, as experience has proved in the past, especially appeals to the travelling public. Perhaps it is interesting to note the genesis of this express service. It began in the old days with the *City of Rome*, when that vessel was taken over by the company to be worked on account of her then owners, the Barrow Shipbuilding Company. At first the *City of Rome* sailed from Liverpool, and as partner in a fortnightly summer service she had for one season the old National liner *America*, and for another the former crack Orient liner *Austral*. Subsequently she was transferred to the Clyde, running with the ordinary vessels of the service. But some ten years ago it was felt that the company would do better to have a modern twin-screw liner to sail fortnightly with the *City of Rome*, and so Messrs. D. & W. Henderson built the *Columbia*, which came out in 1902. She is

485·5 ft. long by 56·2 ft. beam and of 8292 tons gross register. Two years later the *City of Rome* being obsolete, the *Caledonia* followed to take her place. Similar in design to the *Columbia*, she was a slightly bigger ship, being 15 ft. longer and of two feet greater beam. This gave her a larger register by over nine hundred tons. In October, 1907, a third ship, the *Caledonia*, sailed on her maiden voyage in the service. Though again similar to the two older sisters, she is of slightly different dimensions. Her beam is that of her immediate predecessor, but her length is reduced to 470 ft., so that her registered tonnage was between that of the two other ships, being of 8662 tons. As far as can be gathered the vessel now ordered will be slightly larger than any of the others, but in general characteristics she will follow them, experience having shown their entire suitability for the trade for which they are provided.

The Marine Gambling Act.

The President of the Board of Trade has now brought forward the bill by which he proposes to abolish gambling in overdue and "spotted" ships. That such an evil existed has been abundantly proved by the evidence adduced at more than one Board of Trade inquiry in recent months. We know that somehow or other, it got about in seaport towns that such and such a ship was not unlikely to meet with disaster and that relying on such ugly rumours, outsiders—who had absolutely nothing to do with the ship or her cargo—effected insurances upon her. It was manifestly against public policy that it should be to the direct advantage of irresponsible people that ships should be lost, and that that human lives—in which, again, they had no immediate interest—should be jeopardized. It is obviously well, therefore, that the practice should be discontinued. But whether the Board of Trade is taking the wisest course in bringing forward this bill is more doubtful. A criminal offence punishable with imprisonment with hard labour, together with heavy monetary penalties is to be created by the bill. This crime can be committed, not only by the person who effects an insurance without interest, but also by the broker through whom that insurance is so effected. There are certain cases in which contracts are made on terms proposed to be prohibited which are in effect most useful to the business man, and which cannot do any possible injury to either property or human life. The bill as it stands will destroy this commercial convenience, and as far as one can see will do so for no adequate purpose. Public opinion has been directed to the unclean form of gambling disclosed at these inquiries, and the light of publicity has killed the practice. Why not let the matter rest at that and not interfere with legitimate business operations? There is far too much of a feeling in certain directions that everything should be ruled by Act of Parliament. Politicians should realize that some things cannot be effected by statute and that the creation of new offences is often unjust and undesirable.

The Channel Ferry Scheme.

One of the more remarkable shortcomings in our British travel system is the difficulty of connection with the Continent. It is true that there are many and excellent cross-Channel services maintained by fast and comfortable modern vessels. But at many of our ports—especially the important packet station of Dover—the want of facilities between train and steamer is painfully apparent to the traveller, especially to the invalid. These hardships are almost unendurable by delicate persons in wet and stormy weather. The remedy for this state of things is so easy and so complete. A train ferry across the Channel would be an absolute answer to all complaints on this hand, and it would be a huge source of income to the South-Eastern and Chatham Railway. True, it would displace to a large extent, if not altogether, the turbine-engined vessels which they have recently provided for the service. But that is not a serious matter. Moreover, these vessels might find occupation in the Folkestone and Boulogne trade. But look at the advantages it would bring! The existing evils have already been recognised by the directors in the support of which they gave to the abortive Channel Tunnel scheme. All idea of such a tunnel is gone. Public opinion is against it. The cost is so vast and so unremunerative that it is financially out of the question, whilst the ferry scheme offers all its advantages without its objections, and that at a little of its cost. Ferry services of this nature are in active use in many parts of the United States, in Canada and in Northern Europe. It is not by any means therefore an untried system. Steamers suitable for the work are at the present moment under construction in this country. But they are to be sent to Sweden, not to Dover! Why does the Dover scheme thus hang fire? Parliament has some time ago given it its sanction. Important people and strong financial interests are ready with the necessary backing, but the South-Eastern and Chatham directors block the way. Presumably they are jealous for the sake of the tunnel idea which, though dead, they would like to pretend to keep alive. They make the excuse—as I understand—that they have seen no workable plan for stations and piers for the ferry boats at Dover. This allegation is denied by the promoters of the ferry and, certainly one remembers for what it is worth, that some time ago there were announcements that plans for a new station at Dover as big as that at Charing Cross were already prepared and available. Now the Board of Trade has moved in the matter. The President has expressed his desire to see the improvement carried out and has promised to see what effect his representations may have on the directors of the South-Eastern and Chatham Railway. Whether he be successful or not the delay brought about by their dilatoriness and obstinacy is discreditable, even to the Board of that notorious organization, and to my mind it is also short-sighted. If passengers could go through to Paris and beyond without change of carriage, an immense stimulus would be given to the passenger traffic of the company—especially to their night services. Moreover Dover, which now has the advantage merely of a shorter crossing than other routes, would then have the monopoly of a through service of a unique kind, at all events on the North Sea and English Channel Channel. The increase in traffic would far more than make up for the displacement of their little turbine fleet. And then there would be the goods traffic. There is not, indeed, much goods traffic through Dover now. Rates are high and there are two transhipments. But if there were no transhipment and trucks could be sent through without breaking bulk, new traffic would soon be created, and that of a lucrative kind. For it would only be valuable commodities—on which the rate of freight may be high—that would find it worth while to take advantage of the route which, of course, can never be anything else than costly.

The Dominion Line

has now despatched its new steamship, the *Laurentic*, on her maiden trip to the St. Lawrence, and she has achieved the distinction of being the largest vessel which has ever entered the port of Montreal. Her sister, the *Megantic*, is scheduled to make her initial trip on the 17th June from the Mersey. The working of these two sisters will afford to Messrs. Harland and Wolff, their builders, and to the management of the service—which is, of course, for this purpose the whole of the associated lines of the combine—much valuable information as to the comparative economy of the mixed installation of turbines and reciprocating engines (as exemplified in the *Laurentic*) with that of the older system of balanced reciprocating machinery, as fitted in the *Megantic*. For the two ships are, in other respects than their machinery, practically identical. I notice, also, at work in the fleet the famous *Ottawa*, now in her thirty-fifth year. She attained fame as a record breaker in the White Star fleet when she first came out as the *Germanic*, and even now in her old age she is still a comfortable ship, athough but one-third the size of her latest successors in the Dominion service. By the big vessels now at work in her original trade to New York she would appear but a cockle shell.

The Vulcan Shipbuilding Company.

If shipping be depressed both in this country and on the Continent, the shipbuilding trade of Germany does not seem to have been struck with the same disasters. The story the directors tell does not, it is true, seem to be a hopeful one. For they complain that the opening of new shipyards has cut into their profits, whilst they have further been hindered in their operations by a riveters' strike which rendered their works idle for a month during the period covered by the report. In consequence of these circumstances the gross value of the work turned out has fallen considerably from the total of 1907, and the net profit has also decreased from about 1¾ millions of marks to about 1½ millions of marks.

But in spite of all this a dividend of 12 per cent. is declared. This result ought to satisfy the shareholders, and should encourage them to believe that better times and even higher dividends than this respectable amount are in store for them, as the German Navy expands and riveters become contented.

The "Principessa Jolanda."

At last, after upwards of a year and a half's work in the endeavour to raise this unfortunate vessel, the entire hopelessness of their efforts has been brought home to those interested, and they intend to blow up the wreck and to salve what they can of the debris. It will perhaps be remembered that this fine mail and passenger steamer, which was valued at no less than £200,000, capsized as she left the ways in her shipbuilding yard at Genoa, and immediately sank. This was on the 22nd September, 1907. The wreck lay on her beam ends with her upper side awash. It has proved impossible to right the vessel, even though her superstructure has already been removed. Now, as I have said, it has been determined to remove her piecemeal. One of the lessons to be learnt from the incident may be to impress upon those concerned how inexpedient it is to try and launch large and heavy ships with their machinery aboard.

The Cunard Company

have, it is said, determined to dispose of those famous vessels the *Umbria* and the *Etruria*. These two ships have not been out of dock during the present year, and are not scheduled for future sailings. Built at Fairfield five and twenty years ago, the two vessels made as great a sensation in their day as did the *Campania* and *Lucania* some years later, and the *Lusitania* and the *Mauretania* at the present time. It may be noticed, too, that in each pair of sisters, size and power have been practically doubled. The first pair were of just under eight thousand tons and of from 14,000 to 15,000 i.h.p. apiece. The next sisters were of about 30,000 i.h.p. and of, say, 13,000 gross tons register. Whilst the latest and finest couple are of 32,000 tons and of well over 60,000 i.h.p. each. If the *Umbria* and her sister are cast from the fleet, there will be no single-screw liners remaining in the Cunard Atlantic trade. The two ships now being discarded were, in fact, the last vessels of their class to be built on the single-screw principle, and with compound engines, though at a later date the Nord-Deutscher Lloyd constructed with the Vulcan Company at Stettin the *Havel* and *Spree*, single screws with triple-expansion engines for the Express service. But these vessels were soon found unsuitable and got rid of, though in her short career one of them was practically rebuilt into the twin-screw liner *Kaiserin Maria Theresa*.

The Nord-Deutscher Lloyd.

A persistent rumour was current at the end of April to the effect that there was to be an amalgamation between those two huge companies, the Nord-Deutscher Lloyd and the Hamburg-American Line. The report was soon and emphatically contradicted by Herr Ballin, the supreme head of the Hamburg Company. One can see what a huge and powerful combination such a union would mean. But one can also realize the immense difficulties in the way of those who might desire to effect such an amalgamation. At the present time the Lloyd is suffering from a set back, which, no doubt, its managers hope and believe to be only temporary. But the fact that it is being experienced would assuredly cause the Hamburg view of the value of Lloyd shares to be considerably lower than that fixed by holders in Bremen. Even if this difficulty could be overcome there is the essential difference between the class of business of the two concerns, and the view of the managers on such important matters as subsidies. Herr Ballin likes to be independent of direct Government assistance, whilst the late Dr. Wiegand and presumably his colleagues (including his successor as director-general) were of opinion that their services were entitled to State aid and were quick to ask for and accept all they could obtain.

The "Mauretania"

continues to improve on her own records. She arrived at New York on the 29th April after a passage of four days, eighteen hours and eleven minutes. Her best day's run was 652 miles, the speed being 25·79 knots for the day. For the whole distance of 2892 miles her average was 25·36 knots. Returning she made the best run she has yet accomplished to the eastward—the time being exactly that of the westward trip just detailed. The speed on the voyage of 2935 miles was 25·7 knots, and on her best day made another record, steaming 610 miles in the short eastward day. This gives a speed of 26·31 knots. Further in three consecutive days she did 1815 miles, which is also an unsurpassed achievement for the distance.

The London County Council

has sold a fourth steamer from its fleet, the price fetched being £1050. The vessel in question was the *King Alfred*—one of the Thames-built craft.

A Curious Criticism

of Mr. Marconi's invention has appeared in certain newspapers in America. It refers to the use of wireless telegraphy in connection with the rendering of assistance after the collision between the ill-fated White Star liner *Republic* and the Italian steamer *Florida*. It will be remembered that Mr. Binns of the *Republic* called up assistance from the *Baltic* and other passenger vessels, which were certainly not in the neighbourhood and could never have been reached by any other means. But because it is a fact that when the *Baltic* was first called to come to the *Republic's* assistance, she was but some sixty or seventy miles away, and because in the dense fog then prevailing she had to zigzag some 200 miles before she actually sighted the sinking vessel, a writer in the New York Electrical World suggests that "other agencies might be found which would give greater help than wireless telegraphy in such emergencies." But when we come to examine the facts we see that the difficulties of the *Baltic* in her search were bad enough on account of the fog, if the *Republic* had been at rest. But her quarry was an elusive one, the sinking vessel during the hours in which she was being sought, having drifted some dozen miles to the eastward. It would seem that the combination of wireless telegraphy and submarine bell which the *Republic* carried ought to have fulfilled the most exacting requirements in such a case. It may be that wireless does not give exact indications of the direction from which the messages are coming in. But it is surely possible for the operator to give the approximate position of his ship as those in charge of her navigation must be following her position all the time. Dead reckoning under such circumstances may, and probably will, get somewhat adrift. But the approximate position should be known and be communicated, and thus by wireless it should be possible to bring the two ships so close together that the sound of the submarine bell—which is certainly a true indicator of a the bearing whence it comes—should be able to complete the clue for the seeking ship.

Imperial International Exhibition.—In beautiful weather and in the presence of a great gathering the Imperial International Exhibition was opened by the Duke of Argyll on May 20th. The opening ceremony took place on the balcony of the Imperial Tower, which during the winter months has been built in the middle of the "Elite Gardens." As a spectacle, the ceremony was much more interesting than that in the Court of Honour last year, when the rain poured mercilessly down on a forest of umbrellas. The proceedings were brief and bright. A distinguished company, headed by the Duke of Argyll, assembled on the balcony of the new tower, and listened to the singing of well-trained choirs, while famous bands of more than one country united in playing suitable selections. After a short speech by Lord Strathcona, the Duke of Argyll declared the new exhibition open. He referred to the visits the King, President Fallières, and the Prince of Wales had paid to Shepherd's Bush last year, and expressed the opinion that Shepherd's Bush would again show how an education could be gained by splendid illustrations of work and taste.

On a tour of the Machinery Hall we find that a number of the shipbuilding firms on the Clyde are exhibiting, in the shape of small scale models, fine examples of their productions. Among the Clyde firms exhibiting is that of Messrs. Ferguson Bros., Port Glasgow, who are represented by a large number of exquisitely finished models in glass cases of their leading specialities; bucket and suction dredgers, hopper barges and screw tug steamers. These have recently been despatched from the works of the well-known model makers, Messrs. Kelso & Co., 1008, Pollok-

shaws Road, Glasgow. Fulness of detail and accuracy of finish characterize all the models. A great amount of quite unique fittings embodied in the dredger and other craft in question forms splendid testimony to the skill which they bring to bear on this special class of artistic handiwork. The models included one of the twin-screw suction hopper dredger, *Lord Desborough*, built and engined by Messrs. Ferguson Bros. three years ago for the Conservators of the river Thames. This notable dredger has a length of 330 ft., breadth 52 ft. 9 in., moulded depth 22 ft. 6 in., and a hopper capacity of 4000 tons. Another striking model is that of the quadruple-screw vehicular ferry steamer, *Finnieston No. 1*, fitted with elevating deck to carry sixteen loaded lorries, built and engined for the Clyde Navigation Trustees, and now doing service on the Clyde at Finnieston. A third model is that of the single-screw tender, *Darent*, built and engined for the Conservators of the river Thames, and others are the twin-screw barge-loading hopper dredger, *Don Jose*, owned by Messrs. S. Pearson & Son, Ltd., London; the barge-loading bucket dredger No. 3, built and engined for the Maryport Harbour Commissioners, the steam tugs, *Flying Serpent* and *Flying Cormorant*, built for the Clyde Shipping Co., and the twin-screw steamer, *Pioneer*, a double side-suction pump hopper dredger built in 1905 for the Government of Victoria, Australia. Messrs. Simons, Renfrew, have a stand adjoining which promises to be very interesting when completed with models and pictures artistically arranged. Messrs. Brown Bros., Rosebank Works, Edinburgh, show their well-known steering apparatus, the telemotor and wheel for the bridge and aft at the rudder. The Great Northern Railway show two very fine locomotives which draw admiring crowds of visitors, who are permitted to mount the plates and cross from one to the other. The London and North-Western Railway have also a good stand, which promises to be when completed an excellent exhibit. The London, Tilbury and Southend Railway have provision for receiving at their stand an express engine. The North British—with models of the "Waverley" and "Dandie Dinmont," familiar to Firth of Clyde visitors—and North-Eastern Railways also make the place attractive by means of models and photographs, as also do the Furness, Hull and Barnsley and other railway companies. The excellent views of places on the different railway systems are worthy of note, as are those also of continental places. The contractors for tube railways show a section of a tube full size with rails and car complete. The Institute of Marine Engineers add to the exhibits in this section a model showing the refrigerator and chambers for ice, meat, vegetables, wines, etc., to suit a large passenger steamer; a Chinese junk, made by a native carpenter, to show an exact and complete model of the vessel represented, paintings, drawings, engravings and photographs representing interesting incidents, personalities and vessels, historical documents; a valuable and interesting drawing of the *Persia*, executed by David Kirkcaldy—father of the present head of the firm Messrs. Kirkcaldy & Co.'s Testing Works—when draughtsman with R. Napier, the eminent Clyde shipbuilder, a beautiful piece of work exhibited at the Royal Academy, a unique distinction, some forty-eight years ago. The stand of The Cowper-Coles Engineering Co. will repay a visit, also that of the Soho Metal and Scientific Instrument Works, where a fine assortment of specimens of their handiwork can be seen. The Admiralty exhibit a few models of war vessels, and adjoining these The Royal National Lifeboat Institution is represented by more peaceful craft.

"Etruria" and "Umbria."—These two well-known steamers of the Cunard Line will not take part in the company's Atlantic service this season, and it is understood that both vessels will be sold. They were built at Fairfield in 1884, and were the ocean greyhounds of their day.

Steel Testing.—In order to facilitate its work in regard to the testing of steel in Austria, Lloyd's Register has established an office at Vienna. The office is in charge of Mr. M. Koch, an experienced surveyor, who has been for many years on the society's staff. Previously he was stationed at Trieste. The district covered by the Vienna office includes Austria-Hungary and Upper Silesia. Lloyd's Register carries out a good deal of steel testing work, and it is with a view to meeting the convenience of those concerned that the new office has been opened.

NAVAL MATTERS—PAST AND PROSPECTIVE.

(*From our Own Correspondents.*)

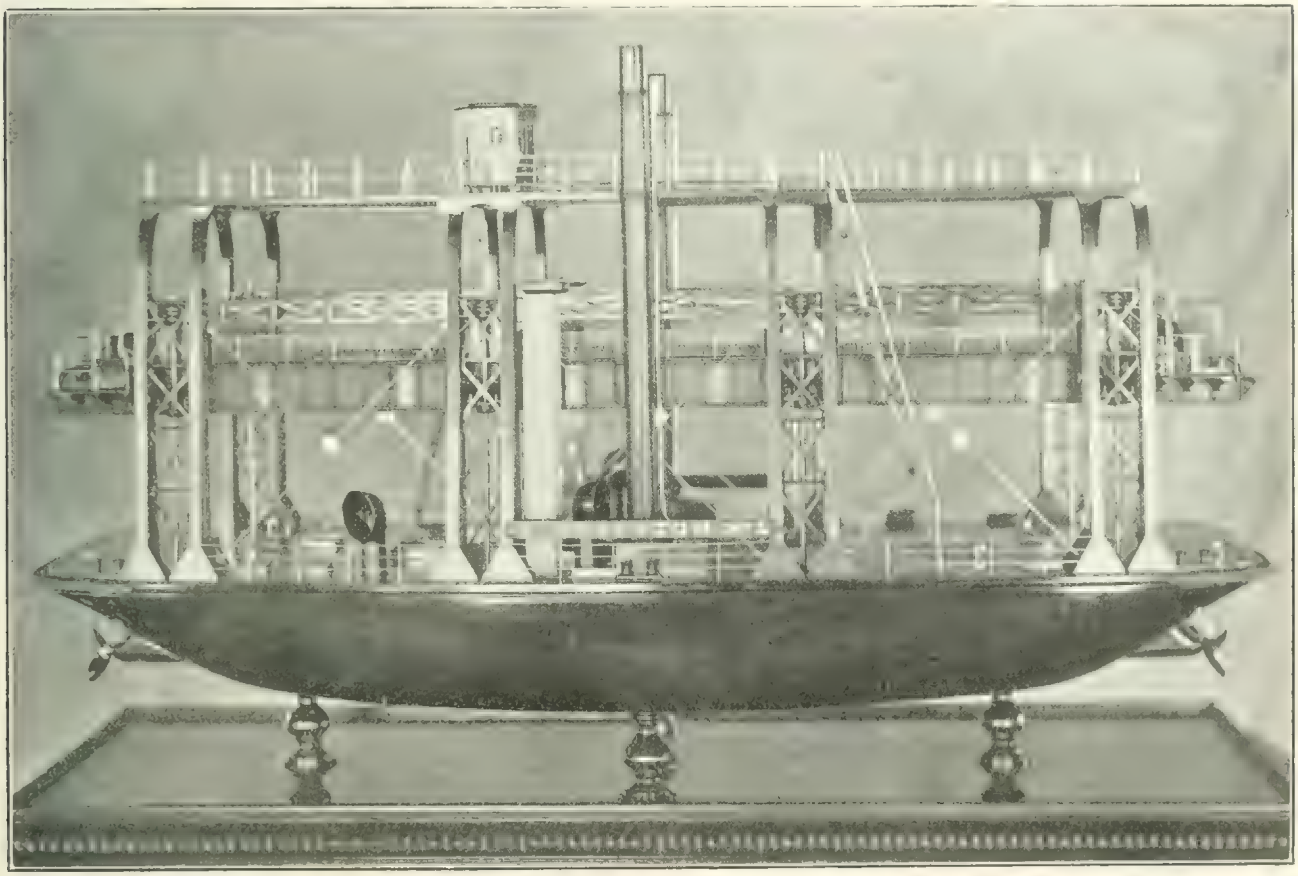
Portsmouth Dockyard.

THE Lords of the Admiralty arrived on May 16th for their annual inspection. Sunday evening is an uncommon time to arrive, but the usual official dinner was given on board the yacht *Enchantress*, on which their Lordships lived during the two days that the inspection lasted. These annual visits, of course, are a mere formality. Years ago they were no doubt necessary, but nowadays individual members of the Board pay frequent visits, otherwise two days would be hardly enough, seeing that, in addition to the dockyard, the Naval Barracks, the Gunnery and Torpedo Schools, the Royal Marines, the Victualling Yard and Haslar Hospital all have to be visited. There is likely to be an unexpected delay in the building of the battleship *Neptune*, the casting for the sternpost having proved unsatisfactory, and this will, of course, stop progress with the work at the after part of the vessel. Satisfactory progress is, however, being made in the other parts of the ship, but the date of launching will probably be later than was anticipated. The battleship *Superb* is due from the Tyne on May 25th on acceptance from the contractors. She is to be commissioned for service in the First Division of the Home Fleet. The crew of the battleship *Illustrious* has gone to Elswick, to navigate the *Superb* to this port. A series of important gunnery experiments carried out by the cruisers *Good Hope*, *Argyll* and *Argonaut*, concluded on May 7th, Vice-Admiral Sir Percy Scott having been on board his old flagship, the *Good Hope*, for the trials. The experiments are understood to have been with a new electrical fire-control apparatus, the invention of Admiral Scott. The results are, of course, strictly confidential for the present. It is stated that the apparatus gave entire satisfaction to the gunnery officials present, and according to rumour the result is said to be that over 50 per cent. of hits have been recorded in excess of those made under the usual battle practice conditions, but this is somewhat vague. It is expected that before long the destroyer *Blackwater* will have been raised. Captain F. D. Gilpin-Brown, who was promoted for his success in raising torpedo boat No. 99 a couple of years ago, has been placed under the orders of the Admiral-superintendent for the salvage of the *Blackwater*. Four of the steel camels constructed for the *Gladiator*, with two steam lighters fitted with pneumatic pumping arrangements, have been taken round to the scene of the wreck. The guns and heavy fittings have been raised. The *Gladiator* has at length been disposed of, having been sold privately to a Dutch shipbreaking company for £15,125, and she is to be towed to Holland to be broken up. It is just about a year since the vessel met with disaster off Yarmouth, Isle of Wight. A most remarkable statement has been going the rounds to the effect that an experiment with the boom defences was to be made, and that a destroyer had been told off to endeavour to jump the boom. Some experiments with boom defences are certainly in contemplation, but the exact nature of them has not yet been decided upon. They will probably take place either at Portland or in Christchurch Bay, and a destroyer may try to blow up the boom so as to open a passage, but as such a feat as trying to jump the boom would assuredly result in the bottom of the destroyer being ripped open it will not be attempted unless with a boat already condemned. The depot ship *Bonaventure* and a flotilla of submarines, which had been for a somewhat lengthy cruise, have beaten the record for that class of vessel, having made a "non-stop" run in heavy weather from the Orkneys to this port. The battleships *Barfleur* and *Centurion*, of the Fourth Division of the Home Fleet, are to be sold out of the service, prior to which they will be dismantled. The former vessel has been brought in to have her fittings landed. The vessels were built at Chatham and Portsmouth respectively, in the early nineties and were reconstructed six years ago at a cost of £150,000 each. The original cost of each ship was about £620,000. Vice-Admiral Robinson, the admiral-superintendent, left us on May 10th, and has been succeeded by Rear-Admiral Tate. There are still plenty of candidates for

dockyard apprenticeships. For seventy-nine vacancies at the examination held in May no fewer than 230 lads competed.

Sheerness Dockyard.

About July 20th the estuary of the Thames will present a most unusual and unprecedented spectacle, it having been decided that the Home and Atlantic Fleets, with their attendant flotillas of submarines and destroyers, are to lie off Southend Pier for a few days. The fleet will, it is stated, be anchored 500 yards from the pierhead, and probably some of the smaller vessels will be taken further up the river. The Nore Special Service Division of battleships has now been constituted, with the *Trafalgar* as parent ship. The *Glory* and *Goliath* came round from Portsmouth and went up to Chatham, where they joined the *Trafalgar* in the steam basin. It has not transpired whether the division is to be stationed at Chatham or in the upper reaches of the Medway. The *Albion*, now in the Atlantic Fleet, and the *Ocean*, which recently went out to the Mediterranean, are to join the division later on. The destroyer *Cherwell* has left to rejoin the First Destroyer Flotilla, and about half a dozen vessels of the flotilla have come in for refit. The *Ostrich*, of the Third Destroyer Flotilla, which was on her way from Devonport to Scottish waters, came in at the end of April with a leaky condenser. This having been put right, she proceeded to Cromarty. Submarines *C* 5 and *C* 6 have completed their refits and *C* 1, *C* 2, *C* 3, *C* 4 and *C* 7 are in hand. The recently purchased steam trawlers *Osprey II.*, *Josephine*, *Assyrian* and *Nunthorpe Hall* have been renamed respectively the *Seaflower*, *Sparrow*, *Spider* and *Seamew*, names which appeared in the "Navy List" not many years ago. The *Seaflower* was a sailing brig engaged in the training service, the *Spider* a torpedo gunboat, the *Seamew* a coastguard cruiser, and the *Sparrow* a gunboat, having a sister vessel the *Thrush* still on active service. A report has been in circulation that the Admiralty are taking steps to organize a reserve fleet of steam trawlers for use in time of war, but the report is discredited. Vice-Admiral Neville only hoisted his flag about three months ago on taking over the command of the Third and Fourth Divisions of the Home Fleet, but in that short time he has flown it in no less than five vessels, the *Magnificent*, *Victorious*, *Vindictive* and *Cressy*, and lastly in the *Achilles*, which has proceeded to Cromarty with the Admiral, who is taking his first cruise since entering upon his present duties. An interesting proof of the improved accessibility of the port for large ships was afforded by the fact that the battleship *Dominion* recently came into harbour in the middle of the night and took up her buoy off the pier without the slightest difficulty. Such a procedure would never have been thought of a couple of years ago. Dredging operations are still going on at the bar, and the harbour will soon be accessible at almost any state of the tide for the largest vessels. Although My Lords have visited Chatham for their annual inspection they did not visit us. The usual practice has been for their Lordships to call here on their way from Chatham, but the yacht went on to Dover. Our inspection will be made later on, probably in July, during the time that the fleets are in the mouth of the Thames, when their Lordships will be present in the *Enchantress*. I referred last month to Commander Wilde, the coaling officer at the port. He has now left us, his successor being Lieutenant G. E. Newell, from the *Sapphire II.*, depot ship for destroyers at Portland.



Models at the Imperial International Exhibition, *Finnieston No. 1*. *See pages 417-418.*

Devonport Dockyard.

The battleship *Téméraire* was commissioned on May 15th by Captain Duff, who was appointed to her in January, and who therefore has seen the vessel through her trials. She relieves the *Implacable* in the First Division of the Home Fleet, that division now including three *Dreadnoughts*. The

Implacable joins the Atlantic Fleet. Satisfactory progress continues to be made with the cruiser *Indefatigable*; indeed, she is growing so rapidly that her launching date is being discussed. A London paper has announced that she will take the water in July, but if she is afloat in September it will be good work, seeing that she will only have been on the slip for seven months. A small fire occurred under the vessel early on the morning of May 7th, two of the blocks on which the hull rests being destroyed. It was probably caused by a hot rivet falling amongst the chips of wood. The construction of the funnels of the battleship *Collingwood* is making good progress, and it is anticipated that the work will be completed by the end of May. The work of converting the old torpedo gunboat *Onyx* into a depot ship for submarines has been completed, and on May 11th the vessel was commissioned as tender to the *Forth*, the parent ship for the local submarine flotilla. The *Onyx*, which belongs to the *Circe* class of eight boats launched in 1892-3, was struck off the effective list four years ago and lay idle at Portsmouth for two years. There are now seven vessels specially appropriated to the submarine service as depot ships, there being now about forty submarines afloat, with a couple of dozen more building or authorized. The destroyers *Arab*, *Leven* and *Ostrich* have left, but there are several of that class of vessel in hand undergoing refits, including the *Racehorse*, which has developed furnace defects, necessitating the removal of the fire brick casings surrounding the furnaces, which are decayed. Defects have also been discovered in the underwater fittings of the *Express*, and it has been found necessary to replace several plates in the vicinity of the boilers and at the bows. The refit of the cruiser *Theseus* has proved so extensive that it will not be completed in time for the vessel to carry out the duties of tender to the Gunnery School until the manœuvres. The *Highflyer* has, therefore, temporarily taken her place. The cruiser *Roxburgh*, of the local division of the Home Fleet, proceeded to Queensferry at the beginning of May, where the Countess of Dalkeith, on behalf of nearly 700 subscribers, representing the county of Roxburgh, presented the ship with a silver challenge shield. The training ship *Cornwall* has completed her refit and has left with the new term cadets for a cruise in Northern European waters. She was accompanied by a destroyer, this being for the purpose of imparting instruction to the senior cadets in the handling of that class of vessel and her boilers. It is seldom that we hear anything of "spies" in the British Navy. A short service seaman, however, was arrested on board the battleship *Majestic* a few weeks ago as the result of the finding of a mysterious letter, in which the writer spoke of "plans." The man admitted being the writer of the letter, but declined to give any explanation. He has now been discharged from the Service. It is thought in some quarters that the man left the letter in order that it might be found, for it was not sealed, his object possibly being to get his discharge.

Chatham Dockyard.

My Lords arrived for their inspection of the dockyard and the naval establishments on May 13th; their first visit being to the Royal Naval Hospital, after which they proceeded on board the Admiralty yacht *Enchantress*, which was moored off the *Thunderbolt*. Landing next morning, they were received by Admiral Sir Charles Drury, Admiral-Superintendent Giffard, Engineer Rear-Admiral Priston, the heads of departments and the captains of the warships in port and also the principal military officers of the garrison. Their Lordships, having inspected the Royal Marine and Royal Naval Barracks, passed the afternoon in inspecting the ships refitting in the yard and also the *Acheron*, training ship for stokers, and the *Tenedos*, the depot ship for training boy artificers. Both the Chatham and Gillingham Town Councils are fully alive to the importance of pushing the claims of the yard in season and out of season. They have just passed a resolution to the effect that, as it is the apparent intention of the Government to build *Dreadnoughts* almost exclusively, immediate steps should be taken to urge upon the Admiralty the absolute necessity of making Chatham Dockyard capable of building and repairing vessels of that class. The month of June will see several vessels out of hand. The battleship *Agamemnon* is to be ready by the 5th, the battleship *Victorious* on the 10th, and the battleship *Dominion* on the 8th. In order to complete the refit of the latter vessel a number o. the men are working night and day shifts. Among othe. work which is being carried out on board are alteration. to the roller paths of the turrets. The battleship *Magnifice...*

Models at the Imperial International Exhibition, *Darent*. *See page 417-418.*

is also to be completed by the middle of the month. The battleship *Formidable*, which has been overhauled, has been commissioned for service in the First Division of the Home Fleet, in which she will remain until the new battleship *Superb* is ready, when she will join the Atlantic Fleet. The cruiser *Diadem*, which has been in hand for nearly eight months, has had her refit completed and has proceeded to Portsmouth. The long time the work has been in hand was due to the fact that precedence had to be given to other vessels which were more urgently needed. The cruiser *Topaze* is also out of hand, and left on May 5th for Kirkwall, where she hoisted the broad pennant of Commodore Charlton, commanding the First Destroyer Flotilla, which had been temporaily flying in the cruiser *Blenheim*. The *Topaze* will be relieved by the *Boadicea*. Three obsolete vessels were offered for sale on May 11th by Messrs. Fuller, Horsey, Sons and Cassell, but only two were disposed of. The battleship *Rodney*, 10,300 tons, which was built here twenty-one years ago, was sold to Messrs. Ward, of Sheffield, for £21,350, and the gunboat *Snap* went for £940. The battleship *Collingwood*, 9500 tons, built at Pembroke in 1886, and which is now lying in the East Kyle of Bute was not sold, the auctioneers being unable to obtain any advance upon £18,900. Another vessel—the destroyer *Hornet*—has been removed from the effective list. The vessel, which has been serving in the Nore Flotilla, came in recently for repairs, but was found to be not worth the cost of refitting. She was built in 1893. Submarine *C* 17, the first submarine built here, and also the first to be built in a Royal Dockyard, has been passed out of hand and has gone round to Portsmouth under escort of the torpedo gunboat *Hazard*. *C* 18, a sister vessel, will, it is expected, be ready for commissioning at an early date. The *Blackwater* court-martial was held at this port on May 10th, the result being that Gunner Irish was found guilty of negligently hazarding the vessel. He was sentenced to be severely reprimanded and dismissed his ship. It is interesting to note that an ex-apprentice of this yard has been appointed professor at the School for Marine Engineers of the Chilian Navy, at Valparaiso. Mr. A. C. H. Connor, who will have the rank of chief engineer, headed the list of local candidates for entry into this yard in 1900, and shortly after completing his apprenticeship won a National Scholarship at the Royal College of Science, South Kensington, where he remained until he received his present appointment.

Pembroke Dockyard.

The twenty-four hours' acceptance steam trial of the cruiser *Boadicea* took place on May 22nd and 23rd, and the vessel is due at Spithead on June 10th. There appears to have been a slight mishap with the after cruising turbine during the vessel's official steam trials. The backs of all the boilers were also badly burned and had to be renewed, a greater thickness of brickwork having had to be built into the backs of the fire boxes. This appears to indicate that the vessel is too small to accommodate turbine machinery of the power with which she has been fitted. Captain De Chair, the First Assistant to the Controller of the Navy, has been here in connection with the adaptation of the vessel as an admiral's or commodore's ship. The *Bellona* is making excellent progress, both as regards the machinery equipment and the hull and fittings, while her turbines and connecting pieces of propeller shafting have been adjusted in position. Rear-Admiral Bearcroft, the admiral-superintendent of contract-built ships, has paid us a visit and inspected the vessel. Another visitor has been Commander V. B. Molteno, the inspecting officer of gunnery equipment on ships building by contract, who came here to decide upon the positions in which the instruments used for the fire-control equipment of the ships are to be fitted on the navigating bridges and at the transmitting station. The last of the fourteen camels has been completed. These floating stages, which are built of pitch pine, have furnished employment for a large number of men for some time, as many as sixty or seventy shipwrights having at times been working on them. They each weigh over 130 tons. The new unarmoured cruiser "No. 1" is making rapid progress, and the refit of the destroyer *Violet* is making good headway. Other work to be taken in hand is the construction of chart tables, similar to one of which details have been approved for the *Bellona*, for the cruiser *Newcastle*, building at Newcastle-on-Tyne, and the cruiser *Bristol*, building at Clydebank.

ELECTRICAL NOTES.

Motor Starting Switches.

To efficiently control an electric motor it is necessary that there should be an uniform acceleration in getting up speed, a regulation of such speed, a reversal of direction and prevention of rushes of current through the armature, but a motor starter is concerned with the first and last of these conditions only. Motor starters are of two kinds, operated automatically or by hand, the latter being the more common. A feature of all motor starters is a series of stationary studs fixed upon an insulating base plate, and to these studs the various sections of the starting resistance are connected and arranged so that the whole resistance may be inserted in the armature circuit at starting, the successive sections being gradually cut out as the speed of the armature increases by moving a lever arm over the contact studs. The resistance coils consist of spirals of wire, metal ribbons or grids, according to current carrying capacity. These coils are arranged so that the heat produced is conducted away by radiation and ventilation. The starting resistance is inserted in the armature circuit and divided so that as the voltage is increased the armature is accelerated uniformly to full speed without taking undue current. A starter is the more efficient according as the number of sections is larger of the starting resistance and for overloading external means, such as fuses and circuit breakers, are employed in the motor circuit. If the sections of the starting resistance are switched out too quickly, causing dangerous rushes of current to pass through the armature, sparking at the brushes occurs, leading to damage and breakdown of the motor. For the purpose required slow motion starters have been devised, but probably the simplest form is the liquid starter which consists of tanks or troughs containing a soda solution. These troughs are insulated and form a terminal of the circuit. Dipping in the solution are metal plates connected to the armature circuit, and the plates may be immersed more or less in the solution and are of such a shape that the resistance varies according to their position, and this resistance of the solution is inserted in the circuit. Liquids, of course, have their drawbacks, but the system is an effectual one. These liquid resistances, however, should not be used for speed regulation.

Insulation.

This question is one of the most important in connection with the industrial applications of electricity. A good insulation must possess the following properties :—High disruptive power, good resistance, ability to withstand wide ranges of temperature, non-hygroscopic, power to resist acids, akalies, oils and be fireproof. Switchboards also require to be rigid. For dynamos on the other hand, there should be pliability and toughness, while cables require that insulating materials should be flexible and have a low specific inductive capacity. As no single substance fulfils all these requirements mixtures are resorted to. An insulator will then consist of rubber, pure and vulcanized, impregnated paper and cotton, varnish, oil and air. For high tension work porcelain and glass are used, also oils. These latter must be mineral, obtained by distillation of petroleum and unmixed with any other substance or have subsequent chemical treatment. The subject is one of some complication and was treated in a paper recently read before the Junior Institution of Engineers. We are not able to give a long list of insulating materials, but a few are amber, marble, mica, shellac and vulcanized fibre.

Electrolytic Corrosion in Sea Water.

This subject is of importance to marine engineers, and for a big job in America experiments were made to test the action of steel and bronze together in salt water. The test occupied two years, and without zinc protection it was found there was a considerable loss in the steel, whereas with the zinc the steel did not suffer in any noticeable way. The sea water was changed at intervals to resemble actual conditions as near as possible. As a result the work for which the experiments were made, *viz.*, lock gates, have had their axles of bronze wrapped in zinc sheets. To decrease potential difference between the steel and bronze as much as possible the zinc should be spread about the submerged steel work so that the fullest protection may be given.

THE WHITE STAR LINER "LAURENTIC."

THE announcement was made early in 1908 that the White Star Line had arranged to associate itself with the old-established and popular Dominion Line in maintaining a weekly service of the highest class of steamers between Liverpool, Quebec and Montreal.

Much satisfaction was expressed at the evident intention of the Company to place the finest and most up-to-date steamers in its new trade, and to maintain the Canadian service in consonance with the best traditions of its New York steamers.

A single-funnelled, two-masted steamer of some 14,900 tons, the *Laurentic* is the largest steamer on the Canadian trade, and as a conveyance of passengers of all classes this steamer—which will also carry a large quantity of cargo and have excellent refrigerated chambers—may fairly claim to meet the most exacting need of both travellers and traders. She is 565 ft. in length, with a beam of 67 ft. 4 in., and in addition to 260 first-class, 430 second-class, and 1000 third-class passengers, will, as already stated, carry a large quantity of cargo. Needless to say, the *Laurentic*—like all the other vessels of the White Star Line—has been constructed throughout on the most approved principles, nothing that long experience and practical knowledge can suggest being wanting to make her as perfect as possible in all particulars. She has been designed on the cellular double-bottom plan, the double bottom extending the whole length of the ship, and being specially strengthened under the engines to give still greater rigidity in the vicinity of the machinery. The vessel has nine water-tight bulkheads, dividing her into ten water-tight compartments. As, of course, is well-known, the double bottom, in addition to being an element of strength and security, provides space for water ballast, which is also carried in the fore and after peaks.

Perhaps the most interesting feature connected with the *Laurentic* will be the adoption in this vessel of a combination of reciprocating engines with a low-pressure turbine, this being the first large passenger steamer designed with such an arrangement of machinery. The *Laurentic* is thereby constituted a triple-screw steamer, each of the wing propellers being driven by four-crank triple-balanced engines, and the central propeller by a turbine. The object is, of course, to retain the advantages of the highly-perfected balanced reciprocating engines, and at the same time get the benefit of the further expansion of steam in a low-pressure turbine, whilst avoiding the necessity for an astern turbine, which is essential in steamers fitted with turbines only, whereas in this vessel, both for going astern and manœuvring in and out of port, the reciprocating engines will be sufficient, as they will develop over three-fourths of the total combined horse-power. It is very appropriate that this practical revolution in steamship machinery, due to the genius of British engineers, should be introduced into the *Laurentic*, and thus celebrate in a special manner the introduction of the White Star Line into its latest sphere of activity.

When it is asserted with confidence, even in these luxurious days, that the passenger accommodation in the *Laurentic* has been arranged with such forethought and care as to render it equal to anything afloat both as regards comfort and beauty, a very advanced stage of excellence must naturally be anticipated. And it may safely be assumed that the combined experience of builders and owners, each with a long record of progress, has not failed to produce in the public apartments and state-rooms in the *Laurentic* results likely to convince the Transatlantic traveller that in this pioneer steamer of the White Star-Dominion service the designer's art and craftsman's skill have each been severely taxed. In the decorations the ideal of the artist has been realized—richness allied to simplicity—whilst one of the happiest features of the public apartments and state-rooms is their height and roominess.

The *Laurentic* will be fitted with the Marconi system of wireless telegraphy, as also with a submarine signalling apparatus, the value of each of which is universally recognised; and it is anticipated she will quickly prove a favourite steamer with all sections of passengers, and so justify the careful thought that builders and owners have given to every detail of her construction.

The *Laurentic.*

The *Laurentic* The Lounge

The *Laurentic* First-class Reading Room

SALVAGE APPARATUS.

THE subject of marine salvage has loomed very prominently on the insurance horizon since the Russo-Japanese war, and an Italian named Cav. Guiseppe Pino has invented ingenious and useful appliances for salvage purposes, and we understand that some of these appliances were bought by the Japanese Government for use on the salvage works at Port Arthur.

We have the pleasure of presenting to our readers illustrations of some of these appliances.

In the first place we will describe that known as the hydroscope which is illustrated on page 425, which is composed of a floating platform from which depends a series of tubes adapted to be shortened or lengthened according to the depth of the water. The bottom of the tube terminates in an optical chamber provided with a system of lenses and reflectors so that objects surrounding the base can be seen from above to a distance of about 2000 square yards.

Powerful electric lamps are also arranged, which are capable of working under water at great depths so as to illuminate a space of about 55,000 cubic yards.

A camera is also applied to the hydroscope so that photos can be obtained of what is visible.

A Pino Elevator being lowered into the sea from shipboard.

An Elevator partially submerged.

Two views of Pino's Excelsior elevators are illustrated on this page. They are constructed in such a manner as to obtain great raising power by the use of very light and easily portable materials. These elevators are formed by double and superimposed envelopes, the inside being waterproof and the outside of a material of high resisting texture. It will be seen from the illustration that the envelopes are of cylindrical form and are arranged vertically between two horizontal platforms. On the upper platform there is a distributor for the air that has as many branches as there are cylinders which are open at the bottom.

The whole device is arranged so that when at work the internal pressure of the air is about equal to the external pressure of the water, so that the materials are subject to

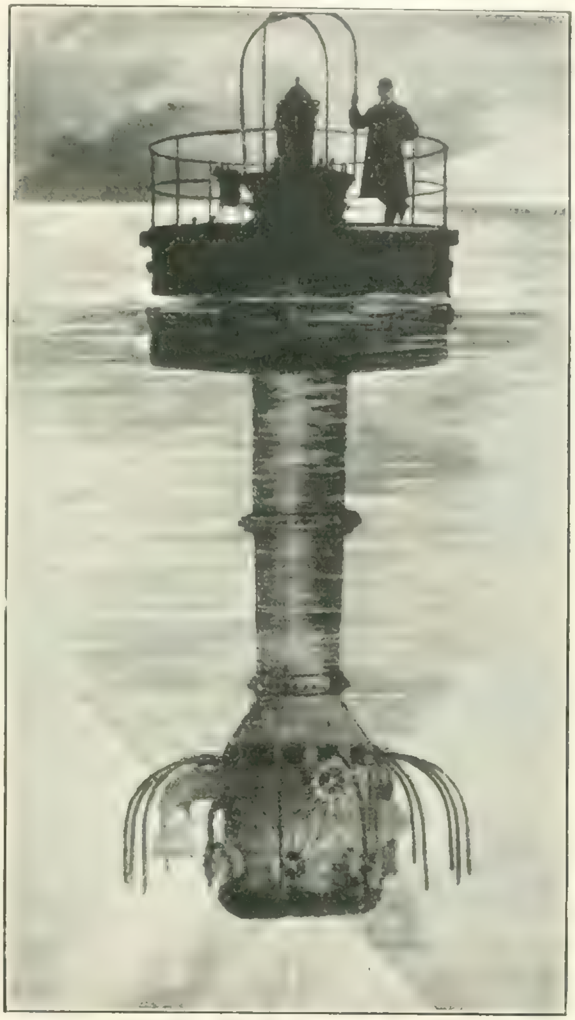
little pressure, no matter at what depth they work.

These elevators are disposed in the hold of the ship and are connected to a source of air pressure which expands them; they are made in sizes capable of each raising 40 tons dead weight.

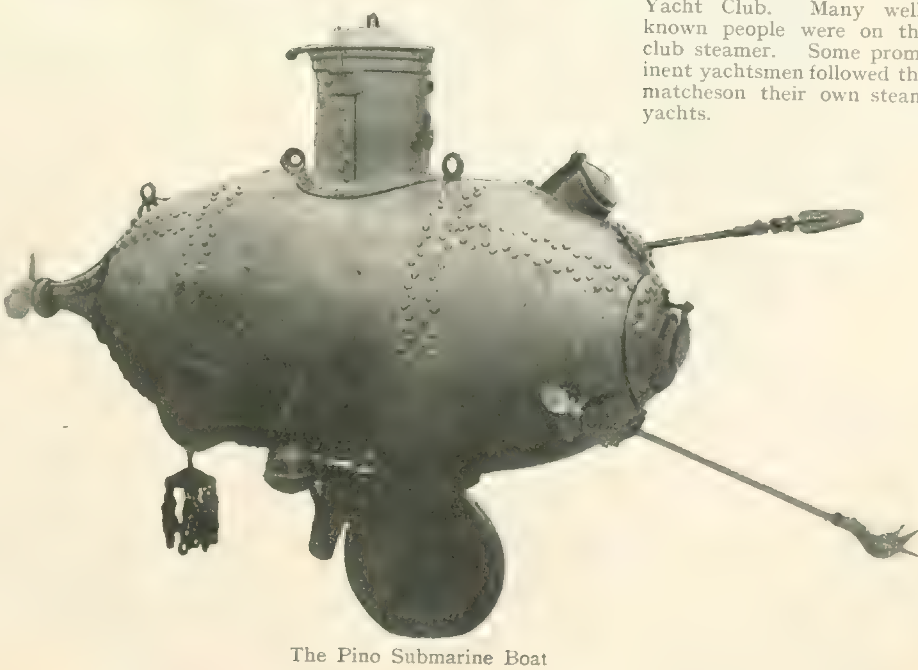
A view of the Pino submarine boat is given which is practically the optical chamber of the hydroscope detached from the telescopic tubes and fitted with supplementary devices, the movements of which are performed electrically. It will be seen that the form of the boat is that of a horizontal cylinder with rounded ends, having several port-holes through which a clear view can be made in practically any direction.

Horizontal and vertical propellers driven by electricity enable the boat to be propelled, while wing-like rudders are arranged for the purpose of steering.

At the lower part of the apparatus wheels are arranged which allow the boat to move along a level sea bed. Mechanical arms are provided extending from suitable holding devices in the shell of the boat, which, it is claimed, can be worked almost with the precision of human hands.



The Hydroscope



The Pino Submarine Boat

THE LIGHTING AND MARKING OF VESSELS AGROUND. —The bye-law passed by the Clyde Trust came into force on the 6th May. In the event of a vessel being aground or submerged the bye-law provides that two red lights placed vertically, not less than 6 ft. apart, and at a height of not less than 20 ft., must be exhibited by night, and two white lights must also be placed, one at each end of the vessel, in such position as to indicate as nearly as possible the extent of the obstruction. Each of such lights shall be of such a character as to be visible all round the horizon at a distance of at least one mile. By day two black balls or shapes take the place of the two red lights, and two red flags the place of the two white lights.

NAVAL COALING RECORD. —H.M.S. *King Edward VII.*, which was Lord Chas. Beresford's flagship in the Channel Fleet, has established a record at Kirkwall by taking in 1021 tons of coal in three hours twenty-two minutes—303.3 tons an hour.

THE INSTITUTION OF ENGINEERS AND SHIPBUILDERS IN SCOTLAND AND THE NORTH-EAST COAST INSTITUTION OF ENGINEERS AND SHIPBUILDERS. — These two institutions will jointly hold their summer meeting in Glasgow early in August. The proceedings will extend over three days, 4th, 5th and 6th, in the new home of the Scottish Institution.

THE INSTITUTION OF MECHANICAL ENGINEERS.—The summer meeting of the Institution will be held in Liverpool, and will begin on Monday, 26th July. A local committee, consisting of the Right Hon. the Lord Mayor of Liverpool, Councillor H. Chaloner Dowdall, M.A., the members of the Institution resident in the neighbourhood, and other Liverpool gentlemen, has been formed to make the necessary arrangements. The meeting will continue over four days.

YACHTING SEASON.—The British yachting season was opened in the middle of last month by the Royal Thames Yacht Club. Many well-known people were on the club steamer. Some prominent yachtsmen followed the matches on their own steam yachts.

THE "INCANTO" SYSTEM OF AUTOGENOUS WELDING.

THE development in the process of autogenous welding still continues, and there is little doubt that the results attained are realizing the claims which were made for the process when it was first introduced.

Much thought has been given to the construction of apparatus for the generation of acetylene gas and

Burst Water Jacket before repair

for the burning of it with oxygen under controllable circumstances, so that the various conditions of working can be readily dealt with by the operator. Some ingenious devices in this direction are put on the market by The Thorn and Hoddle Acetylene Company, Limited, of 151, Victoria Street, Westminster.

Burst Water Jacket after repair.

The acetylene generators are so constructed that they can be left charged, ready for use for any length of time, the supply of gas is controlled with the same facility as that of an ordinary town supply, while the pressure is maintained constant at such a degree as to ensure perfect combustion.

It has been found that with some generators of ordinary construction the yield of acetylene is as low as 84 % but, with the special generators in question, results have been attained, as shown by tests made by Professor Vivian Lewis, ranging from 95 to 99 % of the highest yield possible.

As illustrative of the facility and efficiency with which the welding can be carried out, we represent in the adjoining diagram a cylinder of an internal combustion engine, of which the water jacket has been fractured, and side by side is a representation of the same cylinder after the repair has been effected.

Storm-proof Flare-lights.—In connection with the article on this subject in our May issue, we learn that a large number of important owners have already adopted "Imperial Lights" for working their cargoes, and we understand are fully satisfied that they are superior to any form of light, whether oil or electric, which hitherto they have been accustomed to use. "Imperial Lights" have also been generally adopted throughout H.M. dockyards, and by the War Office and by many other governments, railway companies, contractors, etc., etc., throughout the world.

London's Biggest Liner.—The *Minnewaska*, the latest addition to the fleet of the Atlantic Transport Line, enjoys the distinction of being the biggest liner sailing from the port of London. Honours in this direction have hitherto been divided among the *Minneapolis*, the *Minnehaha* and the *Minnetonka* of the same line. But the new ship, as new ships should, goes one better in point of dimensions. She has a gross register of about 14,500 tons, with a length of 615 ft. 3 in. and a beam of 65 ft. 3½ in. Profitably she might, perhaps, have been bigger still, and doubtless the business in which she is about to engage would have admitted of it. Shipbuilders, however, are bound to have regard to dock accommodation, and it is understood that Messrs. Harland and Wolff, after due consideration of the all-round possibilities of Tilbury Dock, deem the *Minnewaska* about as big a boat as can conveniently make use of it for all purposes. A fine steamship like the *Minnewaska* is suggestive of a promising outlook for the passenger and cargo trade between London and New York.

Electrical Installation on s.s. "Port Morant."—This handsome liner belonging to Messrs. Elder, Dempster & Co., Ltd., was in Glasgow recently, having a complete overhaul, owing to a fire which broke out on board and destroyed the internal fittings to a considerable extent, while the vessel was laid up. The electrical installation of light, telephones and bells are the points which are under consideration. The work which comprised the rewinding of the dynamo armature and field coils, removing and replacing the wiring for the distributing system, the fixing of the telephones and bells with their connections was to be accomplished in the short space of twelve working days. The contract was undertaken by Messrs. Primrose & Primrose, 199, Bath Street, Glasgow, and was completed within the time specified. As stated above, the dynamo was thoroughly repaired, and the steam engine was given an overhaul at the same time. The switchboard was rebuilt to meet the new requirements of distribution. The cables from the dynamo to the switchboard, and from the switchboard, the main cables and those cables to the navigation and pilot lights were armoured. The cables to the lights in saloons, cabins, etc., were rubber taped and braided, in wood casing. The voltage at which the current was distributed was 65 volts, and the incandescent lamps used were the ordinary carbon filament type. The fittings in the saloons were tasteful and in keeping with the other decorations of this ship, which are of a sumptuous character. Throughout the passenger accommodation a system of electric bells was fitted having indicators in the first and second-class steward's pantry and also in the two galleys. A telephone system, which allows the stewards to speak from the pantry to the galley, has also been installed. The officer on duty on the bridge can communicate with the engine-room or the captain's cabin, and the engineer on watch can, if necessary, speak to the bridge or to the chief engineer's cabin. The wires for the bells and the telephones are run in wood casings, and are of the ordinary bell quality.

THE HARKER FIRE EXTINGUISHING AND FUMIGATING APPARATUS.

THE subject of preventing or extinguishing fire at sea is one which is bound to attract the interest of the shipping world, and any suggestion which has that aim in view is well worthy of the thought of those whose interest and responsibility are directly connected with risk and damage to property by fire.

Early last month we had the opportunity of witnessing the demonstration of a new system of, and apparatus for, fire extinguishing and fumigating which was carried out upon an improvised chamber on shore, built to represent the hold of a ship, in the yard of Messrs. R. & H. Green, Blackwall.

The Harker fire-extinguishing and fumigating apparatus, which was the subject of the demonstration, is the joint invention of Dr. George Harker and Captain T. L. Grainger.

The Harker process may be said shortly to consist in the reduction of the oxygen of the atmosphere in the hold of the ship or other confined space to such a point by the addition of an inert gas that combustion cannot be maintained. The steps by which this is effected consist in the abstraction from the funnel of a certain amount of the fuel gas, the cleaning and cooling of it, and finally the forcing of the cooled clean gas into the hold.

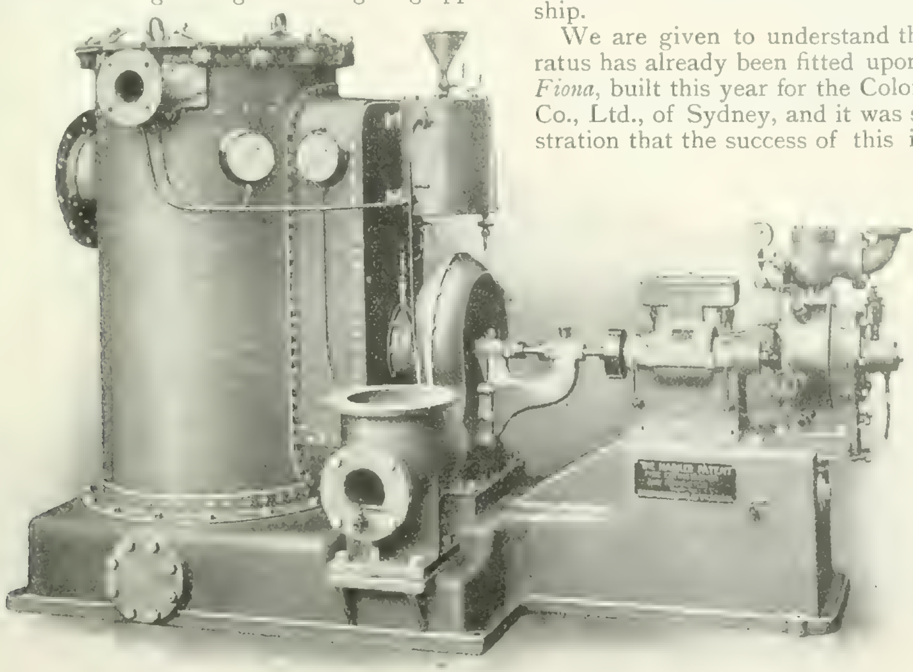
The apparatus by which the process is carried out is represented in the adjoining diagram, and consists of four principal parts—a blower, a turbine engine, a cooler and a distributor—which are all disposed on one bed plate.

A pipe is led from the base of the funnel to the gas inlet on the left-hand side of the cooler. A supply of sea-water is fed into the top of the cooler through the cooling chamber. A fan draws the hot gas through the series of streams of liquid passing down the cooler, so that during its passage the gas is cleaned and cooled and soot and other impurities removed therefrom, which latter pass out continuously with the water from the bottom of the chamber.

From the fan the gases are forced into the distributor, and from this they pass into the pipes, which lead to various parts in the hold of the ship.

The usual percentage of oxygen in the atmosphere is about 21 per cent., and Dr. Harker's experiment showed that if it is reduced to about 15 per cent. the flames from the combustion of ordinary substances can no longer exist and all real danger is overcome. By further reducing the percentage to 10 per cent. animal life cannot exist, and therefore the process is useful for dealing with rats and other vermin on board ship.

We are given to understand that a complete apparatus has already been fitted upon the screw steamer *Fiona*, built this year for the Colonial Sugar Refinery Co., Ltd., of Sydney, and it was stated at the demonstration that the success of this installation had been complete, although no particulars were given as to the conditions of the test carried out on which the opinion was based.



Harker Fire Extinguishing Apparatus.

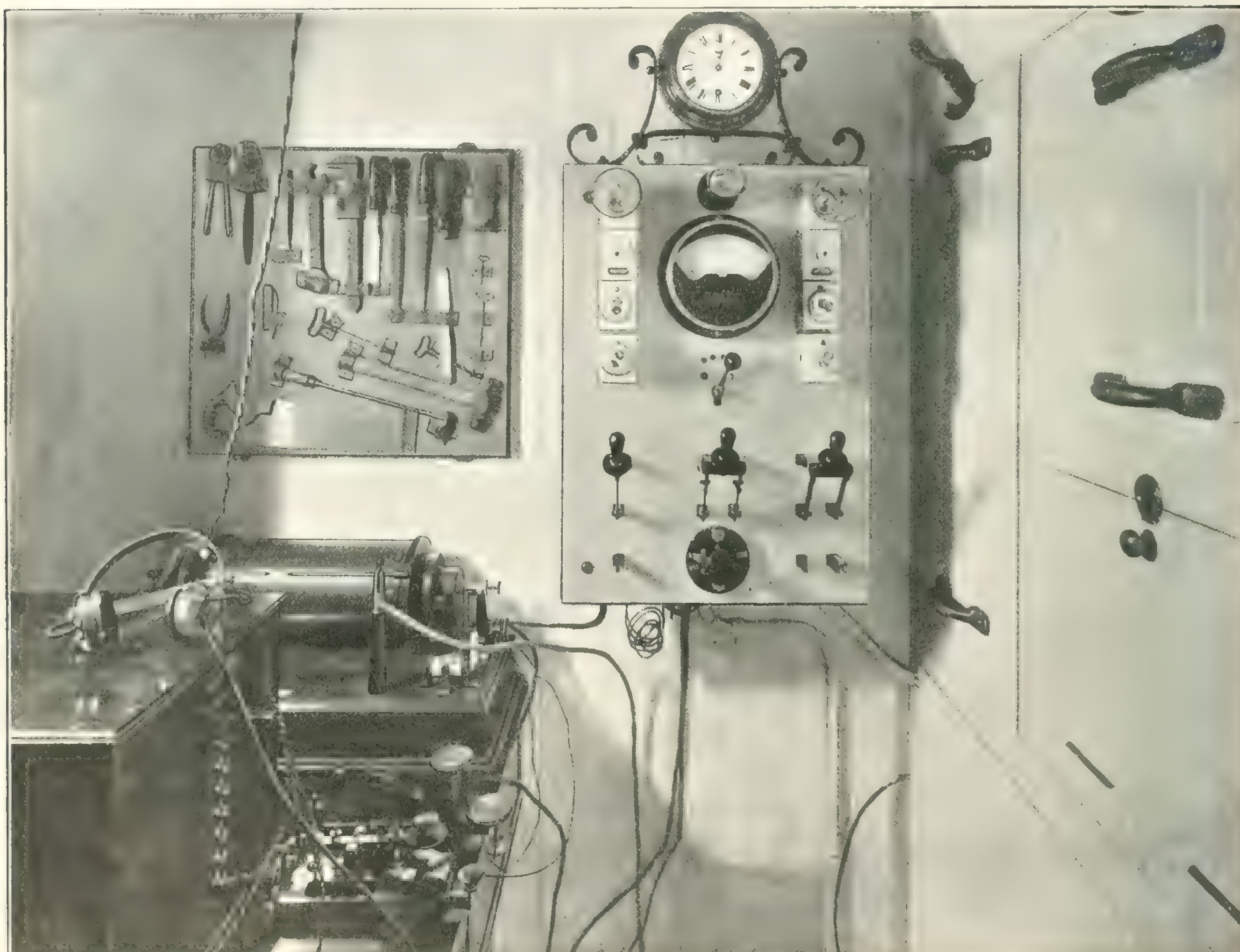
It would be particularly interesting to have some further information with regard to the working of the apparatus on the steamer *Fiona*, in view as to what has been done in a similar direction more than twenty years ago.

In a paper read by Mr. George Canning before the Institution of Junior Engineers in November, 1903, we find among various systems described one process, by Mr. H. C. Carver, which consisted in diverting the gases from the up-take of the ship's boiler furnaces, passing them through a compartment where they were cleansed and cooled, and thence forced by a steam jet to the various holds of the ship. This system was installed on the Liverpool salvage steamer in 1888 for the purpose of treating fires in the cotton-laden vessels, but it does not seem to have been successful.

As the only apparent difference between the Harker

apparatus and the Carver apparatus appears to be the substitution of a fan mechanically driven for the steam jet, it would be interesting to know the difference in function which ensures the success claimed for the Harker installation on the s.s. *Fiona*.

Another point for consideration is the absorption by the hot gas of a certain amount of moisture in passing through the water spray cooler. This moisture would appear to be liable to condensation in the hold, and to deposit on the cargo. In the Carver process this feature of objection is materially in prominence owing to the use of a naked steam jet.



The *Hollandia* Marconi Room.

It would be interesting to have some figures as to the cost of installation of the Harker apparatus on board ship, as its chance of adoption materially depends upon this particular item, and we await with interest the development of this matter.

The Twin-screw Steamer "Hollandia."—The dimensions of the *Hollandia*, of which a general description was given in our February issue, are:—Length, 420 ft.; breadth, 54 ft.; depth, 38 ft. Her tonnage is 7291 tons gross, 4538 tons net. While principally designed and fitted for passenger carrying, the *Hollandia* has capacity for a large cargo, as well, of course, as for the coal and stores necessary for the long voyage from Amsterdam to Buenos Ayres. What this means, as regards the coal alone, may be gathered from the fact that the space exclusively devoted to bunker purposes accommodates 1350 tons. All told, and equipped for the long voyage, with water ballast, water in boilers, bunker coal, cargo, stores, and passengers on board, the *Hollandia* has a total deadweight capacity of 5800 tons, on a draught of 24 ft. Her sea speed at this draught is 14 knots. The vessel has accommodation for eighty first-class, 115 intermediate, and 1200 third-class passengers, while the manning strength of the vessel, including officers, engineers, deck and stokehold hands and stewards, amounts to 125, or a grand total, when the full complement is on board, of 1520 souls. Not only in respect of lighting and ventilating, but in its application to power purposes, electricity ministers to perfection on board in many ways. Altogether there are about 800 electric lamps, of sixteen candle power, throughout the ship. Electricity is seen harnessed to the performance of divers operations and tasks usually done by hand. In the bakery, for example, electricity drives the dough-mixer, in the sculleries and kitchen departments it is applied with potent effect to the peeling of potatoes and the washing of earthenware and other dishes. Electricity also is enlisted in aid of such opposite achievements as sounding the *Hollandia's* steam whistle, lighting cigars in the smoke-room and heating the curling tongs in the barber's shop. It has a part, and a very vital part, in the matter of actuating the water-tight bulkhead doors, and of affording telephonic communication between the bridge and various

The "Hollandia." Engine Room.

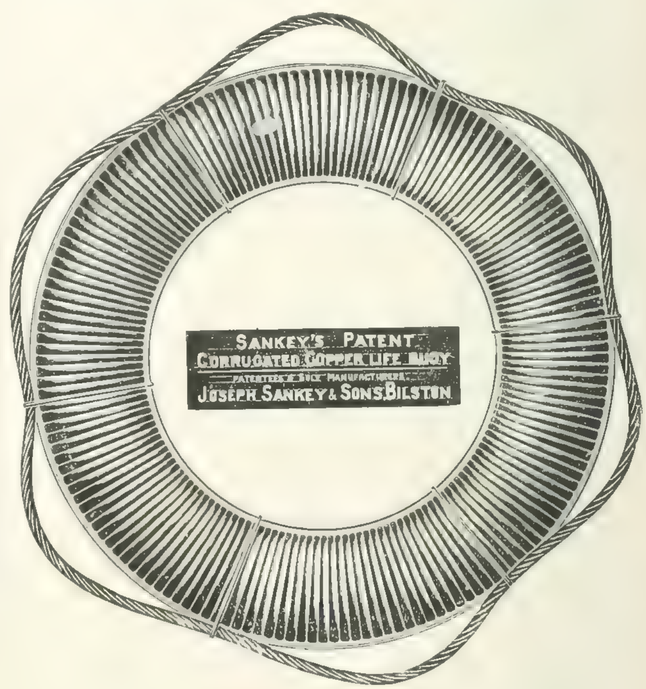
navigation positions. Current for the system of lighting, ventilation and power on board is generated by two duplicate sets of plant situated in the engine-room, consisting of a double-acting steam engine, having cylinders 11 in. and 17 in. diameter by 9 in. stroke, direct coupled to a compound-wound interpole dynamo. The output of each set is 715 ampères, 70 volts, at a speed of 250 revolutions per minute. For controlling the whole installation there is a marble switchboard dealing with fifteen separate main circuits. The whole of the electricity apparatus and fitments have been installed by Messrs. W. C. Martin & Co., Glasgow.

In the vital direction of propulsive machinery and accessories the *Hollandia* is as notable as in other respects, not a few features, indeed, marking a departure from conventional Clyde practice. The twin set of main engines (a view of which, along the starting platform, we give) are of the triple-expansion type, having a combined horse-power of 4500 indicated. Each set consists of three cylinders—high, intermediate, and low pressure—the diameters being $23\frac{1}{2}$ in., $39\frac{1}{2}$ in. and 66 in. respectively, the length of stroke being 48 in. Each cylinder, with its valve chest, is a separate casting with liner, not, as is usual, in one combined casting. Horizontal distance pieces of strong section tie together the main framework of the engines. The high and intermediate cylinders have piston valves, and the low-pressure cylinder the ordinary flat slide valve, the valve gear being of the ordinary link-motion type. The surface condenser is separate from the main framework of engines, as are also the most of the pumps and other accessories. The latter are by the best makers, *e.g.*, Weir's direct-acting feed pumps; Weir's direct-contact feed-water heater; Woodeson's independent main steam feed pumps; Drysdale's centrifugal pumps for ballast and bilge purposes, etc. Steam at 200 lbs. pressure is provided by three double-ended boilers, each having six furnaces all worked under Howden's forced-draught system. The engine and boiler-room equipment embraces all the up-to-date auxiliaries, including Baker's blower for drying double bottom with heated air, See's ash ejectors at each side of ship, and Stone's ash expeller near the mid-line. Amongst features and apparatus on the navigation bridge, specially notable is the small steering apparatus—the telemotor—by which the powerful steering engines of Hastie's make, installed over the rudder head, are controlled, and the huge vessel sent on her proper course. In front of this is the Dobbie M'Innes standard compass by which the navigation officer and the "man at the wheel" are guided in their responsible duties of steering the vessel, and at hand also is the series of indicator pedestals and lever handles of the Chadburn telegraph system communicating with the engineers in charge in the engine-room, and with the warping capstans and winches used in docking, and the windlass in dropping and weighing the anchors, etc. In the vicinity here also is the telephone communicating with the officer at the stern, and on top of the chart-room is a powerful searchlight of Clarke Chapman's make. Equipped, as we have seen, in so ample and thorough a fashion, with everything calculated to safeguard the ship and her living freight in any untoward emergency, it is only natural to find that the *Hollandia* is not only provided with the apparatus and fitments concerned with wireless telegraphy on the Marconi system (see view of the Marconi room) but with the latest form of apparatus for submarine signalling, whereby her navigators will be able to locate the vessel's position in the densest fog or when the weather conditions prevent observation. On the bridge and poop deck there are twelve steel lifeboats, four teak semi-collapsable lifeboats, and two teak cutters. Each of the steel lifeboats, made by the Seamless Steel Lifeboat Co., of Wakefield, is built to special requirements of the owner's naval architect in regard to the quality of buoyancy under any circumstances. By a system of side tanks or water-tight divisions, which are essentially part of the structure, a double skin is provided, and the boats are rendered quite unsinkable. In the event of one, two or more compartments being laid open to the sea, the buoyancy thus in reserve is sufficient to keep the boat afloat. All the boats are hung on davits of Welin's quadrant type, whereby getting out and hoisting the boats are much expedited and rendered easy and safe. A fact of much interest too is that each boat is fitted with a liquid compass and binnacle, and each has been installed and properly adjusted with the boats afloat before being finally housed on board.

LIFEBUOYS, EFFICIENT AND INEFFICIENT.

THE highly buoyant nature of cork as a material has for long justified its employment in the manufacture of life-saving appliances, such as lifebelts and lifebuoys, but in the form in which it is too often combined with other materials, and especially in the neglect of means taken towards maintaining the buoyancy of articles of which it is largely a part—such articles have often little of the buoyant quality the presence of cork is too gratuitously supposed to confer. In the case of lifebuoys especially—exposed as they are to the elements—they change their character altogether in the course of time, and far from being life-saving appliances, often prove, in the event, to be more like death-traps.

Lifebuoys as usually made—a ring of cork built up of little pieces, more or less firmly joined together, and



covered with canvas cloth—may be, and doubtless are, made to conform to the Board of Trade regulations as to buoyant capacity, and when put on board ship, new, are certified and passed as so conforming. With exposure to wind and weather, and variable climatic conditions—notwithstanding, perhaps, that a liberal course of coating with paint is resorted to—the canvas through time begins to rot and wear, or gets cut. This allows rain and sea water to get below the surface until the buoy becomes gradually sodden and water-logged. All this may be going on unobserved or disregarded, but if noticed and attended to, the very means taken to remedy matters is a cloaking over, rather than an eradication of the evil, *viz.*, another coat of paint! Every fresh coat not only adds materially to the dead weight of the buoy, but in covering the open parts of the canvas, it simply serves to retain the water inside to accomplish its deleterious work and render the buoy quite unfit as a life-saving appliance. In a vessel employed on short

voyages, of course, or touching at numerous ports, new buoys can always be procured, or the old buoys can be re-covered. But how often is this done? What sea captain cares to add to the expense of a voyage in maintaining the efficiency of buoys? "No, the buoys will have to do; give them another coat of paint!" is the usual deliverance, if indeed the subject comes up at all. This is no travesty of actual and everyday experience. Time and time again cases have occurred of cork and canvas lifebuoys having been thrown into the water and—promptly sinking!

It is a duty lying closely to our hand to call attention to a type of lifebuoy already well-known to many leading shipping lines. This is the metallic (copper) lifebuoy entirely approved by the Board of Trade, as made by Messrs. Joseph Sankey & Sons, Bilston. This buoy, of which an illustration is given herewith, has a corrugated surface of immense strength, yet it is one third lighter than a cork buoy even when the latter is new and thoroughly dry, and is therefore of greatly more buoyant power. Its superior lightness and buoyancy is an absolutely permanent quality, never becoming impaired through accumulated coats of paint—an old coat being easily removed before a new one is applied—nor destroyed through absorbing water and becoming sodden, as in the case of cork and canvas buoys. The metallic buoy requires no re-covering with canvas, as in the case of cork—will last, with ordinary care, as long as the ship—may always be relied upon for strength and buoyant properties, and finally, will not sink when cast on the sea, nor go to pieces when supporting a man being hauled out of the water, as has often happened with the ordinary cork buoy.

INSTITUTE OF MARINE ENGINEERS.

Visit to the National Physical Laboratory.

On Saturday, May 15th, the Institute of Marine Engineers paid a visit to the National Physical Laboratory, at Bushy House, Teddington, when a large number of members and friends availed themselves of the kind permission of Dr. Glazebrook to view the various rooms.

An important part of the work of the Laboratory deals with the standardization of measures, and the Metrology building, which was first visited, is designed to provide all the necessary conditions conceivable for the utmost accuracy, the rooms being of the double shell type, provided with thermal regulation so as to ensure an equable temperature; while each machine has a separate foundation to nullify the effects of vibration. Engineers to-day turn out work true to $\frac{1}{10000}$th part of an inch, and it is perhaps necessary that the gauges which make possible such accuracy in practice should be tested by machines capable, as it was stated several in this section were, of determining the almost unthinkable measurement of one-millionth part of an inch. Here were seen the screw threads and gauges standardized by the British Engineering Standards Committee, comparators for the comparison of line standards of length and gauges (1 metre and 4 metres) a 50 metre comparator for the standardization of surveying tapes. The standard yard, the British unit of length, was also shown, also an instrument referred to as the "balance upon which the earth was weighed," used to calculate the weight of the earth by determining its density.

The testing of taximeters is, of course, a modern feature, and arrangements are made whereby forty of these instruments may be tested at one time at speeds of from five to fifty miles per hour.

The Electrotechnics division, rooms arranged for tests of machines, transformers, etc., was then visited, the transformer house containing a 100,000 volt, 20 kw transformer, with voltmeter, resistance and switch for measuring up to 100,000 volts. Apparatus for measuring electrical capacity at various frequencies was shown and explained, including a rotating mirror and camera for photographing high frequency sparks up to two million per second. Among other remarkable instruments was the British Association Ayrton Jones Current Weigher, recently installed for the accurate determination of current in terms of weight.

The apparatus which perhaps strikes the imagination as being the most notable is the elaborate tide-predicting machine chiefly used for the compilation of nautical tables. By this means the height of the tide in any part of the world, at any time up to a period of six years ahead can be determined, the machine making in two hours a calculation which it would take the scientist from four to five months to perform.

The Metallurgical department is equipped for tests involving the application of the microscope and pyrometer to the study and the chemical analysis of metals, chiefly for dealing with cases of failure in practice, the analysis of material for special work and for research work. The polished and fractured surfaces of a piece of metal were examined by the visitors through the Rosenhain metallurgical microscopes, and a demonstration was given with the Zeiss apparatus for the photo-micrography of metals by the aid of ultra violet. Another useful apparatus in the large equipment in this section is the Rosenhain quenching apparatus, in which small specimens are heated in vacuo and quenched without being removed from the furnace or exposed to air or other gases.

After making the tour of the buildings, the party, which included a number of New Zealand engineers, assembled to witness a very pleasant ceremony, when the High Commissioner for New Zealand, the Hon. Wm. Hall-Jones, on behalf of the New Zealand section of the Australasian Institute of Marine Engineers, decorated Mr. James Adamson, Honorary Secretary of the Institute, with the Gold Emblem of New Zealand, and declaring him elected a Life Honorary Associate of the Australasian Institute "in recognition of the magnificent work performed by him on behalf of the engineers of the Empire." In making the presentation the High Commissioner referred to Mr. Adamson's career as an engineer, and said that from all quarters he had heard of Mr. Adamson's good qualities and natural qualifications. On glancing through the proceedings of the Institute he had noticed lectures given by Mr. Adamson, which indicated him to be a man of comprehensive mind, who had ideas above the mere mechanical part of his work. He was also one of the best hearted of men, and he had heard of many young engineers coming from New Zealand to the home country whom Mr. Adamson had always been ready to welcome and assist. He hoped Mr. Adamson might live long to continue the good work he had carried on so well and that in years to come he might reap some of the distinction he had won by his merits. He called for cheers for Mr. Adamson, a call which was responded to with great heartiness.

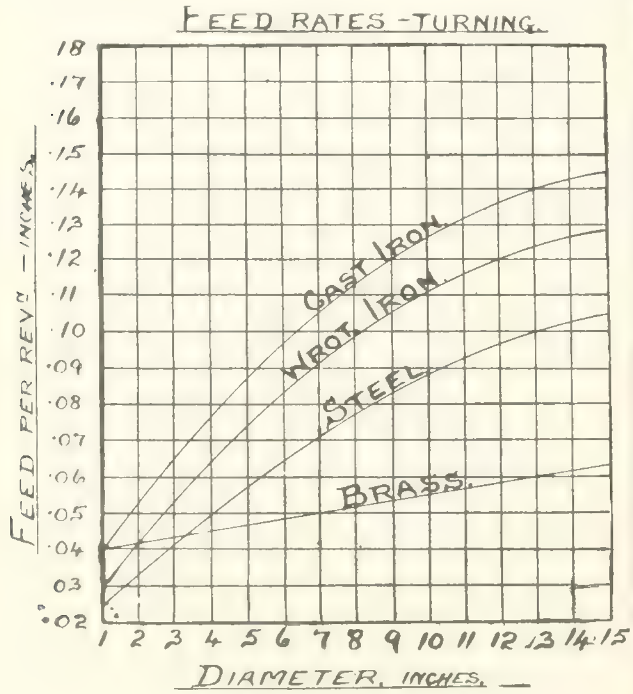
In acknowledging the honour conferred upon him, Mr. Adamson said he appreciated very highly indeed the spirit which animated the engineers in the Colonies to waft across the seas the message and sentiments conveyed to him by letter, the outward and visible sign of which had now been handed to him. The token he had received would be treasured as befitted the manifestation of the beautiful spirit which conceived it, and he would like the High Commissioner to convey to the engineers of New Zealand how deeply he felt their friendly thoughts towards him and the Institute he was associated with, and how keenly he appreciated their action.

In proposing a vote of thanks to the Hon. Wm. Hall-Jones, Mr. Wm. Earnshaw, speaking as a member of both Institutes, said that the words spoken by the High Commissioner were a true indication of the estimation in which Mr. Adamson was held in the Dominion, and Mr. A. E. Battle, in seconding the vote of thanks said, as a New Zealander, he felt very grateful to the Institute in the Dominion for conferring the honour upon Mr. Adamson, and also that the Institute in London was honoured in having one so well versed in marine engineering as the Hon. Wm. Hall-Jones to make the presentation.

Before leaving, a hearty vote of thanks was accorded, on the proposal of Mr. J. T. Milton, to Dr. Glazebrook, for his courtesy in permitting the visit and to his assistants for the interesting manner in which they had explained the matters of interest to the visitors.

JUNIOR ENGINEERS.

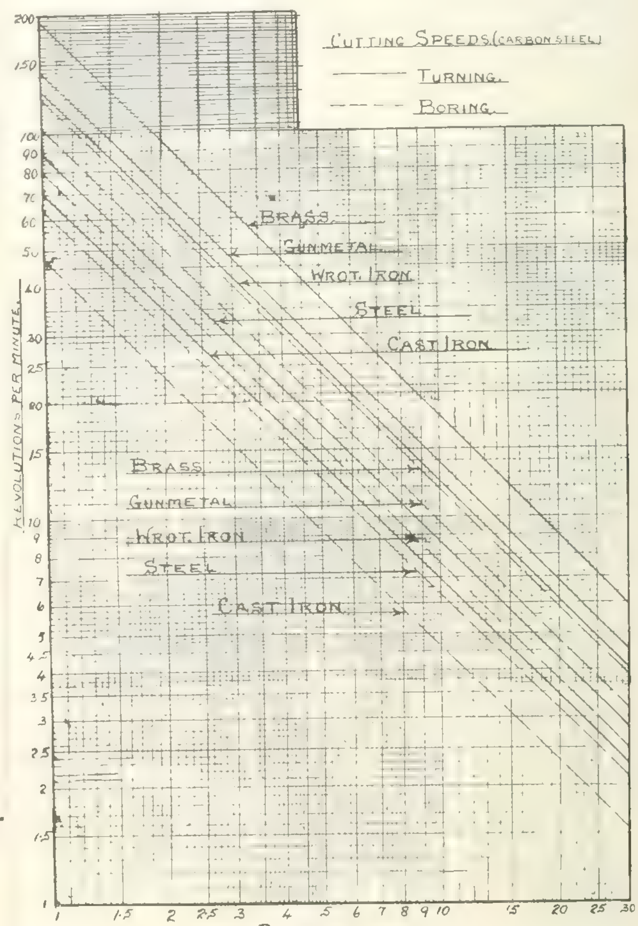
THE constriction placed upon the available speeds of the lathe by the limits of cones and gearing must be, as in the other machines, considered, and the larger the number of obtainable speeds the better for the efficiency of the tool. Various devices have been adopted for securing more complete control over the driving speeds; with the ordinary arrangement of back gear the range of speeds given by the cone pulley is doubled, and in some cases an additional set of gearing is provided to further increase the range, or for the same number of speeds to reduce the steps on the cone, this being still further modified so that a single pulley alone is employed and all the speed changes are operated through gearing, this latter being particularly noticeable with the newest types of automatic and rapid production lathes. A more radical departure is that adopted by Messrs. Lang, the Johnstone lathe makers, their drive almost eliminating gearing. The step pulley is replaced by two pairs of discs, having the form of shallow cones, these being placed with the sloping sides turned inwards. A moderately short belt is used on these pulleys with its under surface, where bearing on the discs, protected by hard wood strips to avoid excessive wear. The alteration in speed is effected by adjusting the distance between the discs so that as they are moved further apart the belt is working on a smaller diameter, and *vice versa* when the discs are brought closer together. The movement of the discs is effected by means of a worm wheel on a quadrant, and the position of a pointer on this quadrant indicating the speed; by this arrangement any speed in the range can be secured and with a minimum of effort. Where the machines are independently driven by motors, speed changes can be effected through a variable speed attachment controlling the excitation.



The variety of work which is classed as turning is so great that no definite speed rates can be laid down which will cover the operations of from stud making on an automatic machine to the boring out of a large cylinder or the turning of a turbine rotor. For the generality of work, however, on the ordinary engine lathe the conditions are moderately uniform, and although the refinements of such as turret lathes introduce complexities of tools and operation the basis is the same and dependent on the heating or dulling of the tool. In cases where a bar is turned from the rough to the finished size to a gauge fit, the vibration and springing of the tool is affected by increased speed and the accuracy tends to be diminished.

For boring work the speeds are in general slower, principally on account of the less rigid form of the tool and the greater difficulty in supplying cooling lubricant. With vertical work, however, these considerations are of less moment and the speeds can be usually raised considerably, and this, together with the elimination of sagging of the boring bar or of the job, renders vertical boring of long thin cylinders both expedient and advantageous, even with the greater care necessary in setting up the job.

The feed rates are limited by the necessity of maintaining a fairly smooth surface on the roughing cut in order to prevent an uneven stress on the finishing tool. As the tool for small diameter work is of a less section than that used for large diameters, the breadth of the cutting edge is less, as also is the depth of cut, so that the feed rate must be slower to allow of the tool operating on the entire surface. In the case of brass work the tool employed is generally of a



narrow section, without side rake, and the width of cut does not increase so greatly as the diameter becomes larger. The accompanying diagram gives the usual feed rates adopted which are subject to a slight modification according to depth of cut and nature of the material.

The depth of cut is principally limited by the power of the machine, and to a certain extent by the rigidity of the tool and its cross section, and by such considerations of the work as the stock to be removed and the nature of the material. If too deep a cut is being taken the insufficiency of power becomes noticeable by the slipping of the belt, due to the resistance of the material to the cut. The resistance is expressed as a pressure on the tool point, which, acting at the circumference of the job of any particular radius, gives a turning moment that, when taken at a definite speed of rotation, gives the horse power expended in taking the cut, and this, with an allowance for frictional losses, estimates the power of the lathe for that speed. For a certain depth and width of cut the resistance increases very little with

increase of speed, and the frictional losses are very nearly constant per revolution at any speed. For a cut $\frac{1}{16}$ in. and $\frac{1}{16}$ in. feed the cutting pressures may be given approximately 400 lbs. for cast iron, 620 lbs. for wrought iron, and 850 lbs. for steel, the materials being of average composition and not specially hard. In general this pressure varies directly as the cut, but is affected by the shape and angle of the tool and its keenness, as well as by the hardness of the material. The pressure is not entirely produced at the cutting edge, but partly by the breaking of the shaving as it slides down the tool, and is therefore fluctuating considerably as the shavings fall to pieces.

As a simple instance of the power required for cutting alone, for a 5 in. diameter wrought-iron bar, the revolutions per minute from the speed graph will be 25, from the feed graph a suitable traverse is $\frac{1}{16}$ in. per revolution, and taking 620 lbs. as the pressure for $\frac{1}{16}$ in. depth of cut, the resisting twisting moment in inch-lbs. reduced to horse power gives

$$\frac{620 \times 5 \times 3.1416 \times 25}{12 \times 33000} = .61 \text{ H.P.}$$

Finishing cuts are taken with as light a cut and as broad a feed as is consistent with removing the roughing tool marks, and in general with a decrease in speed of about 20 per cent. except in the case of brass, where the speed is little reduced and only a moderately broad tool is employed to prevent scoring of the work.

MOTOR NOTES.

MOTOR LIFEBOATS—More than ordinary interest attaches to the three new motor lifeboats of the most recent approved type which left Grimsby some time ago for Scotland The vessels have been despatched by the Royal National Lifeboat Institution to Stronsay (a new station established in connection with the strengthening of the lifeboat service in the Orkneys), to Stromness and to Thurso, Caithness-shire. They are in charge of Commander Rowley, R.N., the Institution's inspector for the northern district, and a special navigating party.

Those for Stromness and Stronsay, the *John Ryburn* and the *John A. Hay* respectively, are fitted with auxiliary motor power and are motor propelled. The *John Ryburn* is one of the self-righting type of motor boats, with a high bulkhead and stern compartments. She is 42 ft. long by 11½ ft. wide, and is fitted with a 30-h.p. Taylor motor.

The *John A. Hay*, however, is a craft of the Watson sailing type, and is more open both forward and astern, through possessing all the qualities of a strong sea boat. She is 43 ft. long by 12½ ft. wide, and is provided with a 40-h.p. Blake motor.

The lifeboat for Thurso is also of the Watson sailing type. She is named the *Mary Austin*, and is a very smart and powerful boat, specially built to replace one stationed there many years ago.

The lifeboat station at Thurso is a very important one, and has a splendid record of life-saving, more than 300 lives standing to its credit. In conformity with custom the Institution has given the crews of all the boats every opportunity for choosing the type they consider best suited to the work they have to perform. The Institution has now forty-four lifeboats stationed on the coast of Scotland, and in the Orkney Islands, whilst its complete fleet round the coasts of Great Britain and Ireland now totals no less than 281 boats.

The adoption of the internal-combustion engine as a motive power for lifeboats has evidently met with considerable success, and a great many lifeboats have recently been fitted with these engines. One of the latest additions to the motor lifeboat fleet is the Walton-on-the-Naze craft *True to the Core*. This vessel is 40 ft. long with a 13 ft. beam, and is of the Norfolk and Suffolk "flooding" type. The latter necessitates the engine being installed in a water-tight case. With this object in view the engine case is built low down in the boat and is lined entirely with copper. The top is then battered down when the motor is started, and the air supply is fed through the top of the casing. All control levers are brought through glands on to the deck. Her installation consists of a four-cylinder 45-h.p. Brooke marine set, and the whole work of converting her from a sailing and oar-propelled vessel to a motor auxiliary was carried out by Messrs. Brooke & Co., of Lowestoft.

MOTOR LAUNCH GUANABARA.—A new fast launch has been designed and supplied to the order of the Brazilian Minister to Japan. The engine is a two-cylinder Gardner petrol motor, with Rankin's reversible propeller, and the hull is by the Riverside Works Co., of Weybridge. The launch, which is named *Guanabara*, was specially designed for the use in rough waters on the Japanese coast, and also for river and lake work. The hull and all the internal fittings are of selected cedar, with brass deck fittings, steering gear, etc. The propeller, shafting and gear are of phosphor bronze and brass throughout. The motor is protected by a very ingeniously arranged casing, and besides this the whole of the forward part of the boat is covered by a spray hood of twill canvas. Before the launch was shipped to Japan, trials were held on the Thames.

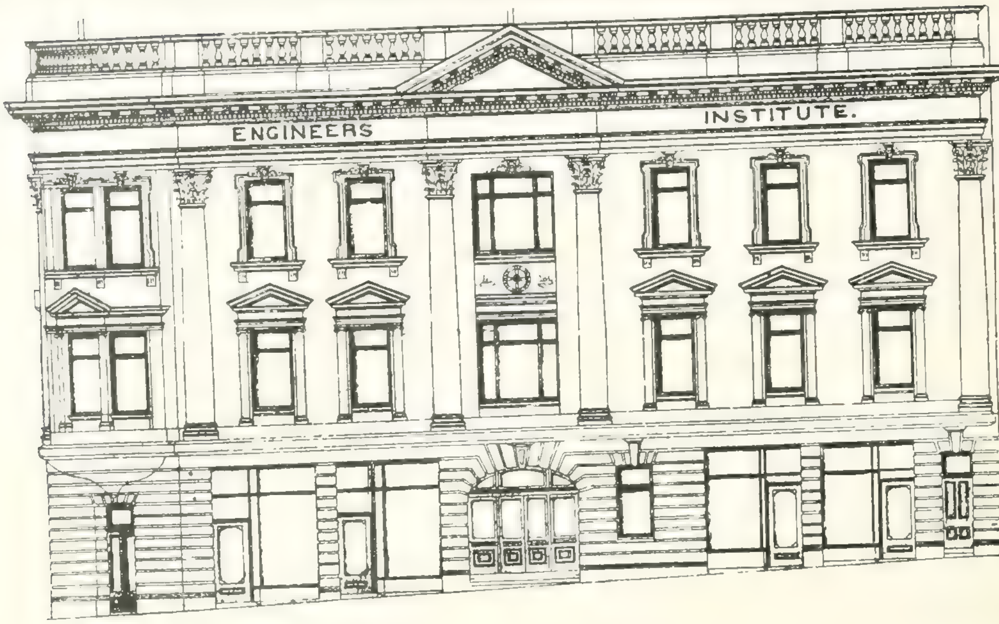
MOTOR LAUNCH CECIL.—A South Coast owner has given an order for a new 30 ft. cabin motor launch, named *Cecil*. The hull is being built by Mr. H. C. Smith, Burnham, and the motor is a 15-h.p. Gardner paraffin engine, with Gardner reverse gear and Rankin's solid propeller. The cabin, which is fitted up for day use, is situated aft, there being a small cockpit behind it, and lavatory and pantry accommodation is provided.

MOTOR LAUNCH PEGGOTTY.—A new fast launch has been built for Mr. Fred R. Binnie, of Glasgow, by Messrs. Leitch & McCallum, Renfrew. *Peggotty*, as the launch is called, is 25 ft. o.a. by 5 ft. 3 ins. beam, and has a 14-h.p. Kelvin motor. She is designed with the object of being both speedy and seaworthy. The stern is of the transom type, and the boat has good sheer and freeboard, the lines forward being also well flared out. The above launches are to the designs of Mr. James A. Smith, of London.

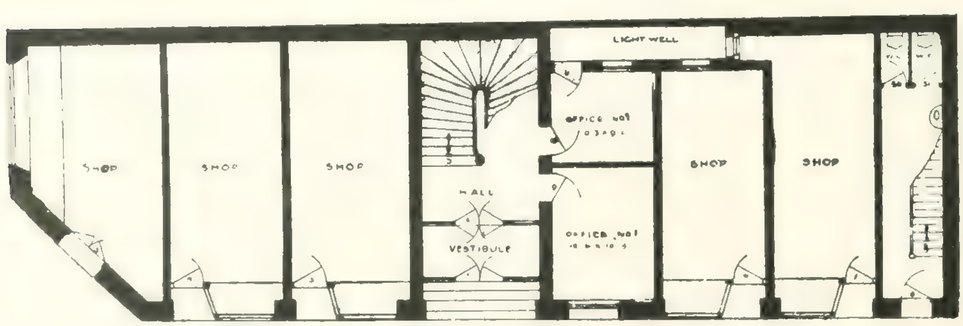
MOTOR FISHING BOAT FOR SPAIN.—A motor boat has recently been completed and delivered from Messrs. Thornycroft's Chiswick yard, which is intended for sardine fishing at Vigo. The boat, without any previous tuning up of the motor, and with only a few short runs made in the neighbourhood of the works, accomplished a continuous run of over twenty-five and a-half hours from Chiswick to Southampton without a stop. From Southampton the boat was transported to Vigo in a steamer. The vessel is 50 ft. in length, with a beam of 9 ft., and a draught fully loaded of 2 ft. 3 in. The weight of the boat complete is about seven tons. The power is 45 b.h.p., which gives the boat a mean speed of eleven and a quarter miles an hour.

AILSA CRAIG MOTOR COMPANY.—This company has several installations on hand in their works at Chiswick, including a 30-h.p. set for the yacht *Rubicon*, and a 30-h.p. paraffin set for a South Coast fishing vessel. They have also under construction three 30-h.p. paraffin sets, two six-cylinder 50-h.p. sets, eleven 16-h.p. sets, one 35-h.p. paraffin set of a new type, ten 8-h.p. sets, and six 4-h.p. sets. In addition a 31-feet cabin cruiser, for estuary work, a 40-feet motor launch and a 25-feet open river boat are under construction.

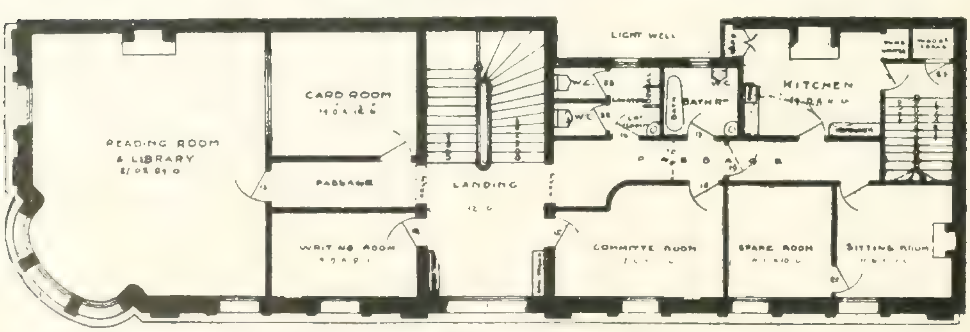
MOTOR-PROPELLED FISHING CRAFT.—The installation of motors into sail boats goes on apace at Fraserburgh and district. The results obtained so far are considered eminently satisfactory, and the new power is likely to become generally adopted among northern and east-coast fishing-boat owners. The following sail boats after being fitted with motor engines have recently made trial trips from Fraserburgh :—*Prestige*, of Cairnbulg, *Boy Fred*, of Broadsea, and *Buchan*, of Inverallachy. The average speed attained by the three boats was 8½ knots per hour. In each of the three craft the engine installed is of the "Gardner" patent and of 55-h.p. The sail boat *Valkyrie*, of Rosehearty, is being fitted with motor power and twin propellers. On May 8th Messrs. G. & J. Forbes, Sandhaven, Fraserburgh, launched a smart motor launch which is to be fitted with a Kelvin engine. Other four Fraserburgh boats are being equipped with motor power, the *Sovereign*, of Rennan, which is having a 60-h.p. Larsen's engine, the *Pansy*, of Broadsea, the *Nellie*, of St. Combs, and the *Provider*, of St. Combs—all three with "Alpha" engines. A new motor drifter to be named the *Gardner* is nearing completion, and is to be fitted with 75-h.p. Gardner engine. The *Valkyrie*, of Rosehearty, is equipped with a Kelvin engine and twin screws.



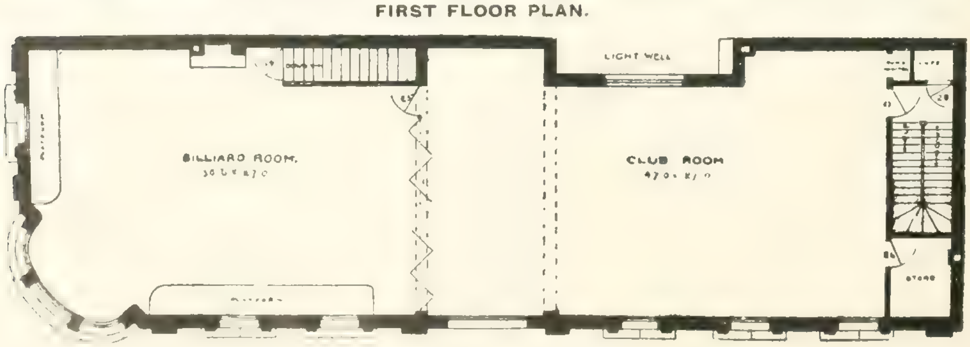
ELEVATION TO AITKEN STREET



GROUND FLOOR PLAN



FIRST FLOOR PLAN.



SECOND FLOOR PLAN

We have pleasure in reproducing the elevation and plans of the new building for the Marine Engineers of New Zealand, at Wellington, the headquarters of the New Zealand Branch of the Australasian Institute of Marine Engineers

Industrial and Trade Notes.

THE CLYDE AND SCOTLAND.

(From our Own Correspondent.)

The New Dreadnoughts.—The contracts for two of the four "Dreadnought" battleships authorized in this year's Naval Programme were placed in the first week in May, one going to the Palmer Shipbuilding Co. on the Tyne, and the other to Scott's Shipbuilding and Engineering Co., Ltd., Greenock. It will be remembered that provision was made for the immediate building of four such vessels, and that the Government also asked for powers to begin the construction of other four in the course of the financial year 1909-10, if they should consider this necessary. Of the first four two are to be built in Royal dockyards and two by private firms. The programme involved the laying down of two "Dreadnoughts" in July, 1909, to be completed in July, 1911, and also for the rapid construction of four to be laid down, if necessary, on April 1st, 1910, and completed by March, 1912. The two dockyard ships will be built at Portsmouth and Devonport respectively. Scott's Shipbuilding and Engineering Co. will make the turbines for their vessel as well as construct the hull. At present they have the contract for the turbines for the "Dreadnought" battleship *St. Vincent*, which is being built at Portsmouth Dockyard, and they have sub-let the work to Parsons' Marine Steam Turbine Co., Ltd., Wallsend-on-Tyne. The machinery for the newer vessel they will, however, make in the extensive new shops which they have specially erected at their Greenock works for the construction of turbines. The Navy Estimates provide that the sum of £516,486 is to be spent on each of the two contract vessels within this financial year. The Greenock firm are to be congratulated on receiving the contract for one of the new vessels all the more because hitherto no "Dreadnought" battleships have been built on the Clyde. The largest warships so far have been the cruiser-battleships *Indomitable* and *Invincible*, built at Fairfield and Clydebank respectively. Scott's Company built the armoured cruiser *Argyll* in 1904, and they have a splendid record not only in relation to that vessel, but also in the construction of reciprocating engines for British warships built in other establishments. The turbines for the new "Dreadnought" will be the first set of machinery of this type to be constructed in their Greenock works.

New Orders.—Scott's Shipbuilding and Engineering Co., Greenock, have contracted to build a large passenger steamer for the Carron line to replace the vessel that was lost. The new steamer will be employed on the Grangemouth and London service. Messrs. Wm. Simons & Co., Ltd., Renfrew, have received an order from Messrs. Sir John Jackson, Ltd., the well-known contractors, for a bow-well barge loading bucket dredger, to be employed in carrying out important improvements at Singapore. The Ardrossan Dry Dock and Shipbuilding Co. have contracted with Messrs. Paton and Hendry, Glasgow (on behalf of Australian owners), for the construction of a passenger and cargo steamer, the engines for which will be supplied by Messrs. Renfrew Bros. and Co., Irvine, and the boilers by Messrs. Dunsmuir and Jackson, Govan. This is the second steamer Messrs. Paton and Hendry have of late placed for the same owners.

The New Orient Liners.—During the month the work of fitting out the new twin-screw steamers built on the Clyde for the Orient Line was rapidly pushed forward, and on the 26th May the *Otway*, built by the Fairfield Shipbuilding Co., was successfully put through her speed trials. This vessel sails on her maiden voyage from London to Australian ports on July 9th. Her sister, the *Orsova*, built by Messrs. John Brown, Clydebank, which was also put through her trials, in the second week in May and steamed to London on May 18th, sails on her first voyage to the same ports even earlier, namely, on June 25th. The *Osterley*, built by the London and Glasgow Shipbuilding Co., Govan, which is also soon to be put through her trials, will take up the next sailing after the *Otway*. The two Belfast-built steamers for the same fleet will follow. Another splendid liner which has been completed and put through her speed trials on the Clyde during the month, is the P. & O. liner *Mantua*, built by Messrs. Caird & Co., Greenock. This splendid vessel left the Clyde for London on May 5th, there to load for her maiden voyage to Australia.

New Turbine Channel Steamers.—Messrs. William Denny and Brothers, Dumbarton, on May 6th, launched the turbine steamer *Duke of Argyll*, the second of two notable additions being made this summer to the fleet of the London and North-Western and Lancashire & Yorkshire Railway Companies' service between Fleetwood and Belfast. The first of the couple is the *Duke of Cumberland*, also launched by Messrs. William Denny & Brothers early in April.

Brazilian Destroyers.—Messrs. Yarrow & Co., Scotstoun, launched, on 23rd May, the torpedo destroyer *Perahyva* for the Brazilian Government, this being the sixth of the set of ten destroyers for the same government which this firm have, for some time, had on hand. The names of the six boats now completed and fitting out are:—*Para Piauley*, *Amazonas*, *Matto-Grosso*, *Rio Grande du Norte*, and *Perahyva*. Those yet to be launched will be called *Alagoas*, *Santa Catherina*, *Perina*, *Sergipe*.

Notable Dredgers.—The powerful suction dredger which Messrs. Simons & Co., of Renfrew, are to build to the order of the Argentine Government for Punta del Indio, in the estuary of the River Plate, will be easily the largest dredger of any kind in South America. Between perpendiculars she will be 285 ft. long, and her draught will be 15 ft. 9 in. A pair of triple-expansion engines driving twin screws are to give her a speed through the water of 9 knots and another pair of the same power are to drive the centrifugal pumps, which are designed to lift a minimum dredge of 5000 tons of clay an hour. If the material dredged per hour exceeds that the Government will pay a premium. The capacity of the hopper will be 53,000 cubic feet, and the vessel will be capable of dredging to a depth of 46 ft. below the water level. According to these figures this is a notable dredger—possibly the largest of her type in the world. Mail advices from India state that until such time as the famous bridge over the Hoogly is completed and ready for traffic it is vitally necessary for the Eastern Bengal State Railway to keep the ferry-way open, and for a considerable time past a powerful dredger belonging to the railway has been at work combating the frequent silting and shoaling of the river at Sara. This vessel, the *Alexandra*, has given the greatest satisfaction and is a credit not only to the railway, but to those responsible for her build and fitting out. The *Alexandra* was constructed by Messrs. William Simons & Co., Renfrew, sent out to India in pieces and re-erected at Howrah by Messrs. Burn & Co., The dredger is 200 ft. long, 38 ft. beam, with a full working draught of 4 ft. 6 in. Her funnels, being telescopic, can be lowered to within 30 ft. of the water line, thus enabling her to pass under bridges. She carries a powerful rotary cutter which can disintegrate the hardest soil to be met with, and she can make a channel 20 ft. below the water line. Her discharging capacity is 3000 tons per hour, and she steams at a speed of 8·35 knots per hour. Altogether the *Alexandra* promises to be a most valuable asset to the railway company owning her.

Dock Equipment.—The equipment of the Rothsay Dock at Clydebank now includes two electric transporters, which may be described as the latest and most approved form of travelling crane. It is expected that these transporters will effect a considerable saving in time and prevent to some extent any congestion in the dock. Last year a deputation from the Clyde Trust visited Germany, and saw a number of electric transporters at work in the harbours there, and decided that something of the kind would prove of service at Clydebank. The features of the transporters are that it raises the cargo, say, an iron bucket filled with ore—direct from the hold of the vessel, proceeds with it at a rapid rate along an overhead steel bridge to a distance of between two and three hundred yards, dumps the contents where required, and returns to the vessel by the time another bucket is ready for lifting. The whole apparatus is worked by electricity.

Obsolete Warships.—H.M.S. *Collingwood*, the last of the obsolete warships, which have for some years been anchored in the Kyles of Bute, was offered for sale at Chatham on May 11th, and was withdrawn when the bidding stopped at £18,900, but has since been sold privately to a Middlesbrough firm for £20,000. It is stated at Rothsay that other two obsoletes are destined for the Kyles anchorage, these being the battleships *Barfleur* and *Centurion*, which were

recently condemned at Portsmouth and are to be sold out of the service. These ships are part of the reserve of the Portsmouth division of the home fleet. They were built at Chatham and Portsmouth respectively, early in the nineties, and were reconstructed in 1903. Their original cost was about £620,000 per ship, and their reconstruction cost £150,000 each.

THE TYNE.

(*From our Own Correspondent.*)

Work for Jarrow.—The announcement that the Palmer's Company, of Jarrow, had been commissioned by the Admiralty to build one of the new "Dreadnoughts," provided for in this year's naval programme, has caused unbounded satisfaction at that hardly-tried centre, and the feeling of confidence in the future, which the new managerial arrangements gave rise to, amongst the local public, has been immensely strengthened. We had faith in the Jarrow company, when things were looking very sombre indeed, that a turn of the tide would soon be experienced, as the splendid resources at their command, in the way of productive possibilities, and their fine record of achievement in the past, could not well be ignored by the Admiralty advisers. It is satisfactory to find our somewhat sanguine anticipations with regard to the future of this establishment already on the way to fulfilment, and we doubt not, that under the strengthened directing power recently inaugurated, this historic shipbuilding yard will continue to hold its place amongst the first. We understand that no time is being lost in the necessary preliminary work for putting down the keel for the battleship, and the largest berth in the yard, which is equipped with overhead electrical hoisting gear, is now almost ready for the reception of the keel. We learn that the company have also secured orders for two or three large cargo boats, and the berths for these are also being prepared. Independently of the improvement at the Palmer's yard, there is also an accession of repair work at the Mercantile Dry Dock Company's works. At the steel works, the forges and the engineering departments, appearances are also indicative of increased work, and there is now no doubt that during the remainder of the year, at all events, the industrial situation at Jarrow will approximate somewhat to what it was in former prosperous periods.

H.M.S. *Superb* is now moored at Bill Quay (in the vicinity of Messrs. Wood, Skinner & Co.'s yard) to be fitted with her final equipment of accessories. This is probably the last battleship that will be fitted out at this mooring place, as it is expected that the fitting-out station at Walker will be ready by the end of June, when the Brazilian warship *Minas Geraes*, will be placed there to have her equipment completed. It is now practically settled that a berth 700 feet long will be dredged and otherwise prepared here, and as it is to be at least 100 feet wide, it is calculated that it will afford accommodation to any vessel that may be built at Elswick.

The Tyne as a Naval Base.—Much attention is just now being attracted to the possibilities of the river Tyne as a prospective naval base, and a deputation of local representative men connected with shipping and commerce is, it is understood, about to wait on the Admiralty, with reference to this subject. The accommodation capacity of Messrs. Stephenson's dry dock, and also of Messrs. Swan, Hunter and Wigham Richardson's dock, has been referred to in Parliament, and one result of this reference will probably be that the facilities of these great repairing docks will become more widely known and appreciated.

It is announced that the Tyne Shipbuilding Company's yard, at Howden, which has been at a standstill since January, is to be restarted on an early date, the firm having received an order for a cargo vessel of good size. Messrs. Readhead are also reported to have booked some further work, and Messrs. Eltringham have been commissioned to build two fishing vessels, by a North Shields firm. The Smith's Dock Company continue to have their pontoons and docks well occupied with vessels undergoing repair, and other graving docks at North and South Shields are being kept fairly busy.

The Engineers' Society.—From the annual report of the Amalgamated Engineers' Society, it is seen that the funds have undergone an unprecedentedly heavy shrinkage during the financial year. This is attributed mainly to the seven months' strike on the N.E. coast. The Executive Council were bound to refer to the strike, by way of accounting for the falling off; but it must have gone against their inclinations to make this reference, and doubtless, they would have much preferred to leave the episode un-recalled.

The Parsons' Turbine Works, Wallsend, are kept going steadily, there being several good orders in hand, and the company's works, at Walker Gate, are also doing well.

Messrs. E. Scott & Mountain have recently had on view, at their Close Works, Gateshead, important installations of electrical machinery for collieries in India and New South Wales, and also for a colliery near Sheffield.

The electrical works of Messrs. J. H. Holmes & Co., Portland Road, continue to have a good share of work, shiplighting being the speciality in this case.

Manufacturers of auxiliary machinery for steamships find it exceedingly difficult to secure orders, and have generally to be content with running a part of the machinery only.

It is reported that enquiries for certain sectional parts of marine engines and boilers have recently become more numerous, and this is regarded as a good sign for the future. Some of the iron foundries at South Shields are showing indications of slight improvement.

Blyth.—The Blyth Shipbuilding Company have for some time past been well supplied with repair work and their graving dock accommodation has been pretty constantly utilised. The company have just received an order for five hopper barges of 1600 tons capacity each, for service on the Humber.

THE WEAR.

(*From our Own Correspondent.*)

Shipbuilding.—Since last month the tone of business in connection with local shipbuilding, has shown a slight improvement, one yard that had been closed for some months having resumed work. It has been stated that at other yards orders had been secured, but as yet there are no tangible evidences of the same. Rumours continue to be current of the early opening of Messrs. Laing's yard, but we have it from an excellent source that this much-to-be-desired event is not likely to take place during the present year.

Messrs. S. P. Austin & Sons are pushing on the work of a new vessel, which is to be launched shortly, and another is in the course of building, but in an earlier stage. The pontoon is at present occupied with a large "turret" steamer (the *Good Hope*) undergoing a shell repair, and there is also a vessel in the graving dock receiving repairs of a somewhat extensive character.

Messrs. Osborne & Graham have at present their berths fully occupied; but one of the vessels is to be launched shortly, and it is said that there is nothing to take its place on the stocks.

It is announced that Messrs. Grace Bros., of London, have placed with Messrs. Short Bros. an order for a large passenger and cargo steamer, to be employed on the Atlantic trade.

Engineering Work.—At the Palmer's Hill Works (Messrs. John Dickenson & Sons) the large steamer *Obi* has just had completed an extensive repair to her engines, including the fitting of a new bed plate. The London steamer *Zephyrus* is now at the quay, having parts of the engines refitted, and it is stated that other vessels with engines requiring repairs are expected shortly. At the Scotia Works (Messrs. Richardsons, Westgarth & Co.) the s.s. *Kelvinbank* has been having new furnaces fitted, besides receiving other engine and boiler repairs. This vessel is also having renewed a refrigerating installation, for the carrying of frozen meat cargoes. Messrs. MacColl & Pollock, of the Wreath Quay Works, have removed their offices to a more convenient site than that previously occupied, and have carried out other alterations, with a view to the greater effectiveness of productive resources. As a result of the slackness of the times the establishment known as the Borough Road Foundry, which has chiefly been employed in the production of marine castings, has changed hands, but will, we understand, still be kept in operation on such work as may be obtainable. It is hoped, too, that under the new *régime*, this old-established foundry may regain some of its former prosperity.

THE TEES AND HARTLEPOOLS.

(*From our Own Correspondent.*)

Middlesbrough.—Last month it was rumoured that two twin-screw steamers were to be built at this port. I understand that financial difficulties have arisen, and no doubt trade has not yet sufficiently shown itself to warrant the building of them, the enquiries for marine work being nearly all for special trades or requirements.

Stockton and Thornaby.—Trade at this port is about the same as last month, and it is thought that Messrs. Craggs' yard will have to be closed, due to financial difficulties. Messrs. Richardson, Duck & Co., also a Clyde firm, have secured the right from Messrs. Craggs to build vessels on the Isherwood principle.

West Hartlepool.—Work is very quiet here. Messrs. W. Gray & Co. have just lost the contract to repair the steamship *Avonmore*, which has gone to Dundee. I understand they have only one vessel on hand for Messrs. Morel, of Cardiff, besides the two vessels for Messrs. Furness, Withy & Co., of this port, which are now completing.

Messrs. Irvine's Shipbuilding and Dry Dock Co. are reported to have secured a contract for building a small steamer on the stocks from which the s.s. *Broomhill* was recently launched for the Broomhill Colliery Co. They have also on hand the s.s. *Tilly Russ* and the s.s. *Grovehurst*, belonging to Messrs. C. H. Ford & Co., which are to have extensive repairs done to them.

Hartlepool.—Messrs. R. Jobson & Son have placed the order for new boilers for s.s. *Garth* with Messrs. Richardson, Westgarth & Co., and they are to be completed in about eight weeks.

Messrs. Irvine Shipbuilding and Dry Dock Co. have launched the first co-partnery steamer, the s.s. *Asiana*, from the Middleton yard, and it is reported the berth will be occupied by the third steamer for Messrs. Elder, Dempster & Co. It has just been announced in the local press that they have secured the contract for building three vessels of over 5000 tons deadweight, but this is believed to be an error, as one boat is in frame and the keel for the second is laid in the Dockyard yard of this firm.

Messrs. Richardson, Westgarth & Co. are reported to have secured the contract to build the third set of engines for Messrs. Elder, Dempster & Co.; also a set for the small steamer to be built at Messrs. Irvine's Shipbuilding and Dry Dock Co.'s yard at West Hartlepool. They are fitting the contraflo system of condensers to their marine engines, of which I hear exceptionally good results have been attained. They are kept fairly busy in the turbine department, of which the installation previously reported is fairly on the way. Great headway is being made with the winch condenser (contraflo type), and it is reported they are expected to be busy shortly on several condensing plant installations, for which they have become justly famous.

Good progress has been made in piling for widening the entrance to the West Hartlepool docks, and as the several jetties have to be shortened to give a clearer entrance, it is hoped larger vessels will be enabled to enter for cargo or bunkers, as the case may be, as this port has been hampered for many years.

THE HUMBER AND DISTRICT.

(*From our Own Correspondent.*)

Hull. Ship Coaling Facilities.—The North-Eastern Railway Company have been looking ahead at their future requirements, and have recently condemned a number of their old and obsolete appliances, and have either completed or have under construction new appliances of a much more modern character, which will, when all are completed, give an increased shipping-capacity of from 1000 to 1002 tons of coal per hour. Part of this work consists of three 40-ton hydraulic cranes, and one 25-ton hydraulic hoist, contracted for by Messrs. Tannett Walker & Co., of Leeds, and the last appliance of this contract No. 23 Crane, situate near the Shear-legs at the Albert Dock, was tested last month. This new crane has powers and is operated by hydraulic power, up to a maximum load of 40 tons. The height of the crane from the Quay level to top of jib pulley pin is 60 feet, at the maximum radius of 45 feet, and the jib can be luffed in or out, giving a total height of 67 feet. The crane is fitted with a wagon cradle which is capable of taking a large 20-ton coal wagon, and twenty of these can be tipped per hour, or equal to a coaling capacity of 400 tons per hour. The old steam crane which it has substituted, would only ship five 10-ton wagons per hour, or equal to a capacity of 50 tons per hour. Two similar cranes under the contract have been erected in place of the old No. 26 steam crane at the Victoria Dock, and the old No. 46 hydraulic crane at the Sir William Wright Dock. The Railway Company recognise that if they are to secure trade, our dock equipment must be of the best and modern type, and in addition to those alluded to, another crane of similar power, but of different design, has been erected by Messrs. Cowan, Sheldon & Co., of Carlisle, in place of the old No. 42 crane, South side of Albert Dock. All the four cranes mentioned are not built exclusively for coaling purposes, as large quantities of general machinery have to be shipped at these berths, and the cranes are designed to deal with this traffic with facility and despatch also. The new coal hoist already mentioned, has been erected at the South side of the Albert Dock, near the Sir William Wright Dock entrance. This hoist is a new and improved type, and it has shipped fifty-one wagons of coal in fifty-seven minutes, or equivalent to 536 tons per hour. The hoist is also capable of dealing with the new 20-ton wagon, which when in use will greatly increase the capabilites of the hoist; 600 tons are expected to be dealt with hourly. All these appliances are at work, but there are in addition under construction by Messrs. Carrick & Wardale, of Gateshead-on-Tyne, two further 40-ton hydraulic cranes, similar to those already dealt with, which are to replace the obsolete steam cranes Nos. 32 and 34 at the Albert Dock, and tenders are also being taken for a 3-ton bucket coaling crane, for the coaling of fishing vessels at the St. Andrew Dock. The whole of the appliances have been built to the design and specifications of Mr. Wilson Worsdill, Chief Mechanical Engineer of the North-Eastern Railway and Dock Company.

Retiring Superintendent Engineer.—Mr. W. T. Head, the retiring Superintendent Engineer of the Kingston Steam Trawling Company, Ltd., was made the recipient of interesting presentations on his retirement, after fifteen years' service. Mr. Head is well-known amongst people having business at St. Andrew's Dock, and was highly esteemed and respected both by his superiors, and by the men under him. This was evidenced by the large numbers of well wishers, who attended a Smoking Concert held at the Manchester Hotel, during the course of which Mr. Head was presented with a handsome gold watch from the employés of the Company, and Mrs. Head with a satchel; a purse containing ten guineas was also handed to Mr. Head on behalf of the Company. Mr. Lawrence Spring (Managing Director of the Company) presided, and among those present were Mrs. Spring, Mr. Widdowson (Director), Messrs. T. Horner, Taylor (Chief Clerk and Cashier), Geo. Lodge, Howard (outside foreman), and other members of the office and general staff and friends. Mr. Spring made the presentation, and said they all deplored deeply the fact that Mr. Head's health had broken down, and his consequent retirement from his situation, which he had filled so honourably for fifteen years. He hoped Mr. and Mrs. Head would live long and die happy. The Kingston Steam Trawling Company had recognised Mr. Head's services, and were very sorry to lose him. The toast of Mr. Head was submitted by Mr. Taylor, and drunk with cheers and hearty singing. Mr. Head returned thanks and mentioned that he had been connected with the Fish Dock for twenty-eight years.

Immingham Dock: Visit of the Admiralty Experts *re* **"Dreadnoughts."**—Great significance is locally attached to a recent visit paid by Admiralty experts to Immingham, to inspect the new Deep Water Dock now under construction there. Sir Edward Raban, Director of Works to the Admiralty, and Admiral Ommaanney, of Portsmouth, made a tour of the dock works. They were accompanied by Sir Jno. Wolfe Barry, the designer of the dock; Sir Alexander Henderson, chairman of the Great Central Railway Co.; Sir George Doughty, M.P.; and Mr. W. P. Vicar, director of the Humber Commercial Railway and Dock Company, the promoters of the scheme; Mr. Sam Fay, general manager of the Great Central Railway Co.; Captain Barwick, port

master of Grimsby; Messrs. Rowlandson and Ball, Engineer and Assistant Engineer to the Great Central Railway Co.; Mr. Shipton, Engineer for the New Barton and Immingham Light Railway; Messrs. Cartwright and Neele, of the Company's Engineering staff; and Mr. White, Traffic Superintendent. The party went in a special train from Grimsby to the dock site, and were met by Mr. Kuhl, the resident representative of Sir John Wolfe Barry and Partners, and Mr. Hollowday, the resident manager for Messrs. Price, Willis and Reeves, the contractors for the Dock. A very careful tour was made of the works, particular interest being shown in the rapidity with which the construction is proceeding, and in the provision which is being made for graving docks accommodation. When completed the graving docks will be able to accommodate vessels of the "Dreadnought" class, and will be able to dock at any state of the tide.

Repair Work.—Messrs. Earle's Shipbuilding Co. and the Central Dry Dock Co., Ltd., have been fairly busy with repair work lately, but it is now tapering off.

THAMES.

(From our Own Correspondent.)

Port Authority Inauguration.—The City opened its arms in appropriate fashion, by way of hospitality at the Mansion House, when a distinguished company assembled to meet the new body. Included in the invitations were all the most important members of commercial London. The Prime Minister, the President of the Board of Trade and the Postmaster General were present, as also representatives from the Bank of England, Shipping Federation, London County Council, the Chamber of Shipping, Thames Conservancy, Lloyds', the Baltic, Trinity House and London Chamber of Commerce. The speeches made by the Lord Mayor, the Chairman of the new authority, Sir Hudson Kearley, the President of the Board of Trade, in whose department the authority comes, and the Prime Minister were all models of what such speeches should be—congratulatory and betokening confidence for the future. Meanwhile, a chief engineer, a warehouse manager and a comptroller have been advertised for, while a very large amount of the new stock has been placed with the shareholders in the old companies.

Shipping Companies.—The vessel, the *Minnewaska*, which is the largest on the Thames, has arrived at Tilbury from Belfast, where she has been built by Messrs. Harland & Wolff for the Atlantic Transport Line. The Royal Mail Co. issue their report, which shows a 5 per cent. dividend on the preference stock for the year, while that on the ordinary was 2 per cent. The company have just had put into the water the *Berbice*, launched at Messrs. Harland & Wolff's. She is one of two vessels intended for inter-colonial service and is 300 ft. long and 2,500 tons register. The Shaw, Savill & Albion Co. issue their report, and pay 5 per cent. on the preferred and ordinary shares. The trade with New Zealand will thus be shown not to have suffered as some others have done.

Shipbuilding.—There is little satisfactory to report in this department. Another company, the Thames Ironworks, have an adverse report to offer, and the continued absence of Admiralty orders shows a loss on the year's working of £25,426, and with utilising reserve a net loss of £16,740. This is not satisfactory for those concerned, but in face of the depression in shipbuilding generally was, no doubt, anticipated.

Council Steamers.—In pursuance of the policy of the Council some of their boats advertised have been sold, £1,000 to £1,050 per boat being the prices obtained. At the same time £14,605 has to be voted for the expense of the boats and piers.

The late Sir Donald Currie.—A memorial service was held at St. Paul's for this distinguished shipowner, under the auspices of the Order of St. Michael and St. George. Many representatives of South Africa were present, as also Lord Pirrie and Mr. Owen Philipps, of the Royal Mail Co. The banner of the deceased shipowner was removed at the service.

Blackfriars' Bridge.—Over the first span of this bridge, on both banks of the river, the floor has been completed as far as the steel work is concerned, giving the thoroughfare 105 ft. in width, and making the bridge the widest in London.

Fleet in the Thames.—The city corporation has voted 2,000 guineas for the entertainment of officers and men when the Home and Atlantic Fleets come to the river in July next.

Yacht Racing.—At a meeting of the Association at the Royal Thames Yacht Club replies were received from Lloyd's Register, the Bureau Veritas and the Germanischer Lloyd, that no reduction in fees for survey could be allowed for the present. The Royal Thames Club has commenced racing, and Sir Thos. Lipton's *Shamrock* was decisively beaten by Mr. Myles Kennedy's *White Heather*, in the leading race from Southend to Harwich.

Engineering Science.—The Imperial College of Science and Technology has received a gift of £50,000 from the Goldsmiths' Co. This sum is for extensions contemplated for new lecture rooms, laboratories and workshops, forming an extensive addition to the Central Technical College, and this offer is in excess of contributions already made by the company to the same institution.

SOUTHAMPTON.

(From our Own Correspondent.)

Messrs. Summers & Payne, Ltd., still continue very busy. Mr. P. Singer's s.y. *Lady Evelyn* has arrived from the Mediterranean.

The Duke of Westminster's s.y. *Grianaig* had a quick refit on returning from the Mediterranean, and is now again in commission. Mr. Miller's s.y. *Maid of Honour*, R.Y.S., had a refit after her return from Marseilles, also the s.y. *Medusa* was refitted and Mr. Johnson's s.y. *Kethailes* is now awaiting her owner off Hythe. Lord Lonsdale's s.y. *Norseman*, R.Y.S., is fitting out, and Lord Normanton's *Allah Karim* had some preparatory repairs and was then fitted out. Mr. James Ross' s.y. *Sheelah* sailed for Canada last month. Captain Gaye's *Vera* (motor auxiliary yacht) unfortunately stranded on Cross House Hard, and on the falling tide took the whole of her weight on her bilge, which resulted in very bad straining and extensive repairs were found to be necessary.

Sir Maurice FitzGerald's *Julnar* was successfully launched on the 18th of May. *Elfreda*, a yacht just completed for Mr. Maskall, sailed for Harwich last month also.

Messrs. Harland & Wolff.—On the 6th of last month Messrs. Harland & Wolff launched the first of two new Inter-colonial steamers which they are building to the order of the Royal Mail Steam Packet Co., of 18, Moorgate Street, London, E.C. The vessel was christened *Berbice*, after the Eastern division of British Guiana and the river of that name. She is expected at this port early in July preparatory to taking up her position on the West Indian station, where, with the sister vessel, she will be engaged in the mail service between the various islands.

The Parsons Motor Co., Town Quay, have been favoured with an order from Mr O. B. Colls for a 28-h.p. 4-cylinder standard pattern marine motor, which is to be installed with a chain drive to another shaft, combined with which shaft will be fitted the Company's free propeller system. A similar order on the same lines has also been placed, *viz.*, a 28-h.p. engine for a 54-ton barge yacht. In this latter installation a Parsons reverse gear will be fitted which, in its neutral position, gives a free propeller for sailing. A 7-h.p. Parsons special auxiliary set has been installed in Lieut. Adams' *Sentinel*. A very successful trial trip has been run with the 25-ton motor yacht *Muignabo*, a twin 28-h.p. Parsons job, which was run over a course extending from Rochester down almost to the Nore and back, on which the speed proved to be about 10 knots, the engines running on paraffin. The owner expressed himself very satisfied with the whole installation. Successful trials have also been run with *Clytic*—10 tons auxiliary set and with motor launch Ashton and Kilner 7-h.p. launch set.

The 60-h.p. engine for the fishing boat *Sovereign* is now being fitted to the boat in Scotland by the Company's fitters. A 21-h.p. motor is in the shop awaiting the hull, the motor being to the order of Mr. Armour.

The Company have received the order to install the 135-h.p. motor in *Yum-Yum* for Messrs. Grahame-White, and the amount of business in hand is very satisfactory, and there is every prospect of a busy season.

The "Cincinnati," the new twin-screw steamer for the Hamburg-American line, called at this port at the end of last month on her maiden voyage to New York. She is a twin-screw screw vessel of 18,500 tons, and is 600 ft. long and has a sea speed of 16 knots.

The *George Washington* will shortly be placed on the Southampton New York service of the North German Lloyd Co. This vessel has a registered tonnage of 27,000 tons and a length of 722 ft., with a beam of 78 ft. Her speed is to be 18½ knots. She is due at this port about the middle of this month. This vessel, from accounts to hand, is to be luxuriously fitted out, and electricity is to play an important part in ventilating, heating and for cooking purposes. From the above it will be seen that the new German vessels are catering for the large class of passengers which prefers comfort and convenience to high speed.

The Royal Mail Steam Packet Co.'s Steamer "Trent" arrived at this port on the 22nd of last month, and proceeded direct into the Trafalgar Dry Dock for the purpose of being surveyed to ascertain the nature and extent of the damage sustained owing to the vessel having stranded in January last on a coral reef outside Cartagena. The vessel, after being salved by the Premier Salvage Association, of New York, proceeded to Jamaica, and thence under her own steam to this port. There will doubtless be some close tendering for the extensive repairs and renewals necessary before the vessel can again take up her position in the company's West Indian mail and passenger service.

MERSEY AND MANCHESTER SHIP CANAL.

(*From our Own Correspondent.*)

TRADE has, unfortunately, been exceedingly bad during the past month, and many of the smaller repairing firms have suffered considerably, but there is every possibility of things livening up a bit during the coming month.

Messrs. Cammell, Laird & Co., Ltd.—This firm's Birkenhead yard has been kept fairly busy with both building and repair jobs. They are pushing ahead with the three new torpedo destroyers which were placed some time ago, and in addition to the new Nelson liner, they have received the order for two new ferry boats for the Wallasey Ferries, which will be commenced very shortly. The Nelson liner is progressing rapidly, the framing now nearing completion. They will also shortly be launching a new coal barge for the Clarke's Patent Coaling Barge Co., Ltd., to replace the one which sank at Egremont some months ago. In their repair department they have a good number of jobs on hand, which include a Dock Board hopper, the Isle of Man Steam Packet Co.'s s.s. *Fenella*, three steamers belonging to the Liverpool and North Wales Steamship Co., and several other jobs of more or less large proportions. The Peruvian Turbine liner *Ucavali*, which was launched last month, is now nearing completion, and her sister ship the *Haullaga* will probably be launched about the end of the month. I understand, also, that they have received the order for the engines of one of the two new cruisers being built at Pembroke Dockyard.

Sierra and Tintore Steamship Co., Ltd.—These people are in the market for two new steamers, which will no doubt be placed on the North-east Coast (probably Messrs. Swan, Hunter & Wigham Richardson).

Messrs. T. & J. Harrison.—I learn that these people are asking tenders for one small steamer for river and coastal service abroad.

Birkenhead Ferries.—The Birkenhead Corporation are now asking tenders for one new ferry steamer, but I believe two boats are to be ordered.

S.S. "Vasari."—This new steamer, belonging to Messrs. Lamport & Holt, Ltd., built by Messrs. Raylton, Dixon and Co., Ltd., left Plymouth on the 26th ult. She will take up Messrs. Lamport & Holt's new service between New York, Brazil and the Argentine Republic.

Messrs. Elder, Dempster & Co., Ltd.—This firm have ordered three large cargo vessels from Messrs. The Irvine Shipbuilding Co., Ltd., West Hartlepool, for their West African trade. They will have a gross tonnage of 3050, their principal dimensions being as follows :—Length, 340 ft ; beam, 46 ft. ; depth, 25 ft. 3 in., with deadweight carrying capacity of 5350 tons. Engines will be of the triple-expansion type with cylinders 25 in., 40 in. and 67 in. by 45 in. stroke, taking steam from two large boilers at 180 lbs. working pressure. The vessels are designed for a speed of 10 knots, and it is expected that the first will be ready for delivery early in September. I understand that the vessels are being built to the builders' specifications.

The steamship *Uromi*, also belonging to Messrs. Elder Dempster and Co., being built by Messrs. W. Harkess & Co., of Middlesbrough, is, I believe, now about ready for despatch, and will shortly take up her sailings to the West Coast of Africa.

Dominion Line *versus* **Wallasey Ferries.**—On the 12th May an action was brought before Sir John Bigham in the Admiralty Court, by the Wallasey Urban District Council against the owners of the steamship *Ottoman* (Dominion Line) for damages caused by the vessel colliding with the Seacombe landing stage some weeks ago. Several serious charges of negligence were brought forward, and eventually the President found judgment for the plaintiffs on the grounds that the accident was caused by negligence on the part of the pilot in charge of the *Ottoman*. The damage caused, I understand, amounts to about £7000 or £8000.

NORTH-WEST OF ENGLAND.

(*From our Own Correspondent.*)

THERE was a feeling akin to disappointment in the district when it became known that the Admiralty had passed by the local firm when placing the orders for the "Dreadnoughts." After the great amount of agitation that has been going on and the semi-official statements that were made by prominent men, one expected that there would be a chance for Barrow in regard to the building of one of these vessels. Of course, the fact that only two were ordered from private builders limited the chance. But one expected that more than two would be ordered. I learn from a good source that the disappointment was practically confined to those who were not in the know. I don't think that Barrow will be neglected in the long run, and when the next batch are ordered it will be found that Messrs. Vickers have secured an order for one.

There was much said some time ago about the Premier interviewing several large gun-mounting firms respecting the increasing of their plant. This gave one the impression that a large amount of work was to be placed—and very soon—but we are still waiting for some, and the amount of men employed in the local works on British orders are comparatively few, and the report from Newcastle with regard to Messrs. Armstrongs seems to be the same.

The "Vanguard."—The British "Dreadnought" is growing rapidly, and up to now there has not been the slightest hitch in connection with her completion. The foremast has been placed in position, that is, the tripod has been fixed, and one funnel has also been placed on this vessel. Anyone who notices her draught will be able to realize the great amount of material that is being placed on board. As regards the machinery, most of this is in now, and it will not be long before the other funnel is put on. In a month or six weeks' time, perhaps, they ought to be putting steam through the turbines. A great number of men are working on board of her and it looks as if Messrs. Vickers wished to push forward in such a manner as to have some time to spare at the finish in order to devote more time to trials, etc. The accident to the men who were leaving this vessel through the breaking of the gangway has resulted in a new gangway being built close to the big crane. This will always be a fixture, and will certainly prove safe enough for all emergencies. In connection with this accident, in which one man was killed, the jury at the inquest have taken a very peculiar stand. They brought in a verdict that the man was killed by the breaking of the gangway, and added that they were of opinion that a more searching examination should have been made of the gangway before it was put in use. The Coroner absolutely refused to record the rider, as he called it, pointing out that the evidence was opposed to such an idea as existed in the minds of the jury. Thereupon the jury after several adjournments, said that they would not sign the inquisition unless the Coroner recorded their opinion. The Coroner was

obdurate, and eventually bound the whole of the jury over to appear at the Lancaster Assizes, when the matter will be settled by the Judge of Assize. This is almost a unique occurrence, and has excited great interest in the town. The case comes before the Judge on June 14th.

The "Sao Paulo."—Up to the present there has not been very much work going on on the Brazilian battleship *Sao Paulo*. The fact of the matter is the British "Dreadnought" has to receive a great amount of heavy material on board yet, and until she does the Brazilian must take the outside berth. As soon as she does come under the big crane there will not be much time lost, for most of the material is ready. Her engines and boilers are all ready to be put on to bogies to be taken alongside the *Sao Paulo*.

"Dunottar Castle."—The Castle liner, *Dunottar Castle*, has arrived in Barrow to undergo internal alterations to the specifications of Dr. Lunn, of the Polytechnic Tours. She will take the place of the ill-fated *Argonaut*, which was sunk in collision last year. The *Dunottar Castle* is to be altered in record time, and she was no sooner alongside the wharf before a big crowd of men were aboard her. Already she is advertised to sail for a cruise to Norway at the end of June. It is not known yet whether she is to be altered in outward appearance, but a mast has been taken out, and it is possible that she will undergo certain alterations, such as will give her a more modern appearance.

"The Transporter."—The cargo vessel transporter, which was built by Messrs. Vickers to take out the two Japanese submarines to Japan, has returned to Barrow *via* Hamburg, where she discharged her homeward cargo. This vessel had to be submerged to take in the submarines, which were floated in in one of the Liverpool dry docks, and the same proceeding had to be gone through to discharge them at Japan. This vessel will now come in very handy for the conveyance of material to Spain (Ferrol and Cartagena) in connection with the Spanish contract. At present she is loading the boilers and machinery for the Brazilian scout, which was launched last month from Messrs. Armstrong's yard at Elswick.

Floating Crane.—The 75-ton floating crane built for the Canadian Lakes has left Barrow in tow of a continental tug for Montreal. This crane, which only draws some 3 ft. 6 in., has been tested to 90 tons, and she can also be used as a grain elevator. Last year she was taken out of the port of Barrow and, when some hundreds of miles from the North of Ireland in the Atlantic, there came dirty weather and eventually the tug had to abandon her. Eventually she was picked up by two steam trawlers, who towed her into Stornaway, and she was then brought back to Barrow looking none the worse. It is to be hoped that a better fate awaits this structure in the Atlantic this time.

The Argentine Orders.—Nothing has leaked out in connection with the Argentine contract. There are lots of rumours, and the most of them are to the effect that Messrs. Vickers and Messrs. Armstrong have secured the work. There is nothing official as yet, and it may be some time before an authoritative statement is made. It looks on the face of it a certainty that the Barrow and Newcastle firm will share in this work. They have by far the best yards to deal with the work. They have the best resources and, further than this, they are capable designers of ships and engines, and this means a great deal in connection with a power such as the Argentine. The work would be very welcome to Barrow and, of course, as Messrs. Armstrong do not build boilers and machinery, that work will come to Barrow. A short time ago a daily paper ventured the opinion that this combination had got the order, but they were a bit before their time, although perhaps they were not far from the mark.

The Spanish Work.—It will not be long before there is a start in the Spanish work. Mr. Campbell, late shipyard manager at Messrs. Vickers, and now the manager of the new yard to be built at Ferrol, has left Barrow for Ferrol, and that means that the contractors will be commencing work immediately on the new yard. The three battleships have to be completed in six years, so there is time yet. There has not transpired any further news as to whether the propelling machinery for these three vessels is to be built in this country. Shortly a number of men will be taken from the several yards to Ferrol to take up responsible positions in connection with the construction. Of course, in the first year or two there will be more British workers there, and as the time proceeds these will be reduced to make way for the native hands, who will then have picked up the work.

Submarines.—Three more submarines have been delivered to the Navy, these being the "C 22," "C 23" and "C 24." They are of the improved design with engines of the gasolene type, built to the specifications of the Admiralty. They were accompanied by the cruiser *Vulcan*, which acts as tender and the destroyer *Cynthia*. They sailed to Ramsey, Isle of Man, for trials, then to Campbeltown, where the cruiser coaled. They then proceeded to Portsmouth *via* Holyhead. There are the "C 20" and "C 21" completing at Barrow now, and they will sail shortly, accompanied by the destroyer *Vulture*. All these five submarines, it is said, are to form a new submarine base on the East Coast of Scotland—Dundee is mentioned. They will be attached to the *Vulcan*, which, it will be remembered, was a repair ship for many years in the Mediterranean. Considerable experiments are still being carried out in connection with the submarines at Barrow, and the mysterious "D 1" is still lying alongside the wharf waiting for the completion of her machinery, which, it is understood, is a big jump in a new direction. This vessel is entirely different in design from the "A," "B" and "C" classes, and if a success will mark an important step.

Iron and Steel.—The iron and steel trade is slowly improving. The Barrow works have got into working order their large installation of gas engines which are driven with blast furnace gas, and these are supplying the blast to the furnaces and all the electric power and lighting necessary in the works. In addition to this, gas is now used in the boilers on the steel works side, and this means a saving of no less than about 1000 tons of coal per week. Barrow has of late suffered owing to the heavy cost of carriage on fuel from the Lancashire and Yorkshire coalfields, which has averaged about 6s. per ton; all this and the cost of coal is done away with now. Iron is improved, and makers are asking 58s. 9d. per ton nett f.o.b. for ordinary mixed Bessemer numbers. Warrant iron is improved, and at present sellers are asking 55s. 4d. per ton nett cash. Ore is improved and prices range from 11s. to 17s. 6d. per ton nett at mines. Rails are at about £5 7s. 6d., upwards a few shillings for heavy sections.

Shipping.—There is a welcome improvement in shipping owing to the restarting of the Barrow Steel Works. Irish and foreign ores have been imported in increased quantities and the exportations will now improve. Up to the present the total shipments of iron and steel as compared with the same period of 1908 show an improvement of about 24,000 tons.

BELFAST.

(From our Own Correspondent.)

Messrs. Harland & Wolff.—Since last month's notes were penned this firm has completed and handed over, after highly satisfactory trials, the Atlantic transport liner *Minnewaska*, and the steamer *Mallina*, built for the Australasian United Steam Navigation Co., Ltd. The *Minnewaska* is a notable vessel in that she is the largest steamer owned by the Atlantic Transport Co., and is bigger than any other vessel using the Thames. She has a length of 615 ft. 3 in., beam 65 ft. $3\frac{1}{2}$ in., and a tonnage of 14,500 gross. The *Mallina*, which has been specially designed and built for the Colonial trade, is 363 ft. long, beam 44 ft. $3\frac{1}{2}$ in., and gross tonnage about 3200. On May 7th the Intercolonial mail steamer *Berbice* was launched from the south end of the Queen's Island. The new steamer has been built for the Royal Mail Steam Packet Company's service in the West Indies, and is the first of an order for two similar vessels. The *Berbice* is 313 ft. long with a beam of 38 ft. 3 in., and 2500 gross register. The propelling machinery consists of two sets of quadruple-expansion engines of the balanced type. A large steamer named *Leicestershire*, for the Bibby line, will shortly be ready for launching.

Messrs. Workman, Clark & Co.—By the launch of the *Atenas* on 8th May, this firm has further added to the long list of fruit steamers turned out from its yard. The *Atenas*, which is a vessel of 5000 tons gross, has been constructed to the order of the Tropical Fruit Steamship Co., and is a sister ship of the *Abangarez* and the *Turrialba*, launched this year for the same owners. The trial trip of the former steamer was referred to in last month's notes, and the latter is at the

time of writing receiving the finishing touches prior to going to sea. Messrs. Workman, Clark & Co. have received an order for the construction of a coasting steamer for Mr. W. A. Grainger, of Belfast. In the way of repair work they have almost completed extensive repairs to the Newcastle steamer *Stowford*. On May 7th a fire broke out in their engine works pattern store, and although a considerable amount of damage was done to patterns, the fire was fortunately got under without spreading to adjoining buildings.

Messrs. Maccoll & Co. are building the machinery for the above-mentioned coasting steamer, for which Messrs. Workman, Clark & Co. have contracted to build the hull. In addition to a satisfactory amount of new work, they are engaged upon extensive hull and machinery repairs to the steamer *Heathfield*.

CORRESPONDENCE.

We do not hold ourselves responsible for the opinions expressed by our correspondents.

The Schmidt Superheater.

To the Editor of the MARINE ENGINEER AND NAVAL ARCHITECT.

Sir,—Referring to the article in the May issue of your Journal on the Schmidt Superheater. From my experience as a marine engineer, I think the author is certainly claiming too much, where he states the estimated actual loss due to the presence of water in the engine to be "25 per cent. to 50 per cent. of the quantity of coal used, varying with the cut-off and the speed at which the engines are worked," and it would be hard to convince most sea-going engineers that there might be such a loss. Surely something must be very far wrong in the working of the engines and boilers before even the smaller percentage of loss could be reached; indeed, it seems to me a slight on the ability of the engineer to allow the statement to pass without question. The article further states "it is found that the most economical results are obtained from the Schmidt system when a steam temperature of 600 deg. F. to 650 deg. F. is employed, and that with this temperature the coal consumption will be, in the case of triple-expansion engines, 15 per cent. to 20 per cent., and in the case of compound engines 22 per cent. to 30 per cent. less than the similar engines using ordinary saturated steam." While such a high saving would be welcomed, I am inclined to think it is more a theoretical than a practical gain, and while the Schmidt Superheating Co. may have thoroughly tested their system and satisfied themselves that such a saving exists, it would be interesting to know the conditions under which the results were obtained. An example of the advantage to be derived from the use of superheated steam in coal economy is given by comparing the coal consumed per hour, on the paddle steamer *F. Haniel I.* running with and without the superheater in use, under the same conditions. Without the superheater, the coal consumed per hour was 22 cwts., and with the superheater in use the coal consumed was only 16 cwts. It is stated that the superheater was shut off, but probably not in this case removed entirely. I do not think it would therefore be a fair test, as the superheater pipes led through the smoke tubes would considerably reduce the draught, with consequent increased coal consumption. The author of the article claims that the fitting of the superheater would reduce the number of firemen, but he does not explain how this is to be carried out. While such an argument might appear desirable, every sea-going engineer knows that the number of firemen has been reduced quite enough already, as in time of trouble and even for "field days" he realizes that he is hampered for want of assistance. Another point that would interest engineers would be a comparison between the annual cost of maintenance to engines and boilers on board the paddle steamer *F. Haniel I.* before and after the superheater was fitted, and as the superheater has been fitted since 1905, such a comparison should not be difficult to obtain.

There are other points which could be raised and discussed in connection with the system; for instance, cleaning of smoke-tubes, lubrication, wear and tear, etc., and I am sure many of your readers would be interested to have the views of experienced engineers on the various questions connected with wet and dry steam, and I hope that such will be forthcoming.—Yours faithfully,

24th May, 1909. A. W., M.I.Mar.E.

OBITUARIES.

MR. STEWART GORDON HORSBURGH.—We regret to have to report the death of Mr. Stewart Gordon Horsburgh, the late superintendent-engineer to the White Star Line, who died on the 1st May in his 73rd year. The deceased gentleman was one of the shining lights of the engineering profession in Liverpool, insomuch that he participated in the great progress which the White Star Line has made during the past two or three decades, and the extensive knowledge and experience which his unique career enabled him to obtain have made his opinions and views very much sought after and appreciated. He was a member of many scientific societies, and was responsible for the development of a number of useful inventions in connection with marine engineering, and was also an hon. chief engineer of the Royal Naval Reserve. He retired from the position of superintendent-engineer to the White Star Line in 1904, and was succeeded by Mr. W. J. Willet Bruce, but was retained by the Company as their consulting engineer.

ANDREW WINGATE.—The death occurred at Crieff on May 9th, of Mr. Andrew Wingate, Underwood, Crieff, and Oswald Bank, Partick, who was among the last of the old Clyde engineers and naval architects, having been junior partner with his father, Mr. Thomas Wingate, J.P. (who founded the firm in 1822) in Thomas Wingate & Co., shipbuilders and engineers, Whiteinch. The firm designed and made the engines of the *Sirius*, the famous pioneer Atlantic steamer of 1838; did much to deepen the rivers Clyde and Tees and the Rio de la Plata with their then new dredgers; and in the fifties were for a short time consultants to Comte Ferdinand de Lesseps in the Suez venture. Many of the steamers of the old State Line, after absorbed in the Anchor Line, were their work. As iron-bridge designer the senior partner's experience began early in the last century with a bridge over the Ribble for his cousin, Mr. Wilson, of Whitby Castle, one of the well-known Hull shipowning family. The deceased, who was born at Whiteinch, and educated at Glasgow High School and Anderson's College, was twice married, his first wife being Miss M'Gregor, daughter of James M'Gregor, of Finnart, head of Tod & M'Gregor, of Partick, the once well-known shipbuilding firm, who are often referred to as the "fathers of iron shipbuilding" on the Clyde.

BOOKS RECEIVED.

The Year Book of the Scientific and Learned Societies of Great Britain and Ireland. Compiled from official sources. 25th annual issue. London: Charles Griffin and Co., Ltd., Exeter Street, Strand.

Compressed Air Work and Diving. By G. W. M. Boycott, A.M.I.C.E. Price 10s. 6d. nett. London: Crosby Lockwood & Son, 7, Stationers' Hall Court.

Welding and Cutting Metals by aid of Gases or Electricity. By Dr. L. A. Groth. Price 10s. 6d. nett. London: A. Constable & Co., Ltd., 10, Orange Street, Leicester Square, W.C.

TRADE CATALOGUES AND LEAFLETS.

Aspinall's Patent Governor Company.—We have received a copy of a new catalogue recently issued by the Aspinall Patent Governor Company, of 7, Strand Street, Liverpool, which includes a number of illustrations showing the method of application of the device to modern engines, together with descriptive matter of the apparatus and instructions for fixing, regulating and keeping the governor in working order. Included also is a list of names of over 1800 modern steamers which have been fitted with the governor, and copies of a number of testimonials are given at the end of the catalogue, indicative of the utility of the device under conditions of great stress and bad weather.

Messrs. William McGeoch & Company, Limited.—We have received a series of leaflets from Messrs. William McGeoch and Co., Ltd., of 28, West Campbell Street, Glasgow, relating to new apparatus for fixing cabin doors, which they have lately put on the market. There is no doubt a distinct demand for any device that can minimise the trouble to

passengers in large steamships and thus to increase their comfort and it would appear from a perusal of the leaflets that the devices dealt with will certainly attain this purpose. Special reference may be made to the Watts' patent Dor-a-jah attachment, the Johnson's patent cabin hook and Mullan's patent spring cabin hook, all of which are extremely ingenious contrivances. We understand that the firm is having an increased demand for their shipping specialities, both from home and abroad.

REVIEWS.

The Naval Annual. Edited by the Hon. T. A. Brassey. London and Portsmouth: J. Griffin & Co.

THE twenty-third issue of the Naval Annual has been awaited with deep expectation in many responsible quarters, for it has been felt that in its columns will be found a reliable comparative statement of the actual and prospective powers of our own and rival Navies. The statements which "Brassey" contains are not re-assuring, though every attempt seems to have been made to avoid an alarmist tone. Those responsible for the Annual are of opinion that our strength to-day is equal to our requirements. This does not seem to have been questioned by any serious speaker or writer. The point has been whether our present programmes are equal to giving us the strength, when the ships they contain come to maturity, which the situation, as then existing, will demand. The editor admits that this year's programme should have provided for the construction of "certainly six and possibly seven" capital ships, instead of the four actually promised. So, however he may deprecate scares and panics, the editor of "Brassey" undoubtedly shows that there is reason for uneasiness and agitation in the country. There are two chapters in the book which will especially appeal to our readers—one is that which deals with the question of Dockyard Administration. It shows how hopeless and helpless Government want of system was in the past, and how present day practice is already effecting improvements and economies upon the old state of things. Still the writer is able to point out that there still remains much to be done, and he indicates directions in which reform may be pushed. In the other chapter Mr. Alexander Richardson deals with the question of Alternative Systems of Propelling Machinery. He naturally speaks highly of the turbine system of propulsion. Experience has tended to increase the public approval of its reliability, its comparative freedom from breakdowns, and its low cost of upkeep, whilst the difficulties which may be met with in its use are not inherent in the system. Further, he believes that there is still much room for further economy in its working. This may be attained, at least in part, by improved condensers and possibly by the use of superheated steam. Of the alternative modes of driving ships, that by the gas engine seems to meet with the writer's most favourable opinion. By the way, he speaks of the use of cylinders of "as much as 110 inches in diameter at sea." But adds that these are for horizontal engines. If the reviewer's memory is not greatly at fault, some of the early compound engines of the old Guion and Inman lines had vertical cylinders of as much as 120 inches. But let that pass. Beyond and above the special articles to which we have referred, Brassey contains its general history of the World's Navies in 1908, together with the usual tables and diagrams of ships, armour and guns. Brassey is always useful. At the present time it is almost invaluable.

Hydrographical Surveying. Wharton & Field. Nett 21/-. London: John Murray. 3rd Edition.

THIS is the third edition, which, owing to the lamented death of the author, Rear-Admiral Sir William Wharton, since the last edition, has been carefully revised and brought up-to-date by Rear-Admiral Mostyn Field. The work has been enlarged by the addition of some new features, including expedients connected with work in the field, which have been found useful in practice. These instances will be found of use to young officers who are not entirely familiar with all such practices unless their attention is called to them. Amongst the fresh matters referred to in this edition we may point out the following: The use of photography for the reproduction of chart drawings on smaller scales, and the special style of drawing consequent thereon; the development of the Pillsbury deep-sea current meter, a new form of automatic tide-gauge, and its possibilities for use in deep water; the application of the range finder to surveying purposes; an improved slipping apparatus for ship sounding; and the practical effect of better knowledge of the nature of the slope of the bottom at different depths, in connection with searching for vigias. The commencement of this work deals with the ordinary instruments which are used by surveyors, and tells in what way these instruments may be handled to be correct for use. The test of a measuring chain before use, to ensure that it will measure correctly, is given, and also instructions as to the holding and reading of a pocket aneroid. The following chapters deal with the general principles of a marine survey and to the main triangulation and the making of a main station. The convergency of the meridians is pointed out as affecting the true bearing of any two points on the earth, in which the angle of a great circle drawn between the two positions makes the true bearing of these stations. This involves the use of spherical trigonometry. The use of the ship for triangulation is well set out, and a running survey, which is the least accurate form of sketch survey, is well defined, for sketching in the coast line, and some especial information is given as to the fixing of main points. The sounding from the ship or boat is marked out as being the most important point in which accuracy is demanded, which must depend upon the state of the tide. In harbour work on large scales great accuracy is required, both as to the soundings and the accurate fixing, when done by a boat, of its exact position at each end of the line on which the soundings have been taken. The volume concludes with chapters upon the estimation of heights and the necessary observations for latitude and obtaining longitude, with instructions as to the publication of completed charts, which all form excellent study for those who are engaged in hydrographical survey.

The Marine Steam Turbine. J. W. Sothern. Nett 12/6. London: Crosby, Lockwood & Son. 3rd Edition.

THIS work has been re-written, brought up-to-date and greatly enlarged from the previous editions. The author states that seeing the remarkable sea performances of the cruisers *Indomitable* and *Inflexible*, and the record Atlantic passages of the *Lusitania* and *Mauretania*, these have proved the absolute necessity for the adoption of turbine machinery where high powers and speeds are specified. He considers that the reciprocating engine is now to all intents and purposes obsolete, as the author is of opinion that all new vessels for the British navy will be fitted with turbines of the Parsons type. The German and other Continental engineering experts who criticised adversely the adoption of turbines for the Atlantic passenger service, have now admitted their mistake, whilst foreign navies, notably those of France and Germany, are also largely adopting the turbine for cruiser and battleship designs, whilst as regards coal and steam consumptions, this is as low, or even lower, under full power conditions than that of the best modern type reciprocating engine. The section in this volume on Workshop Practice has been specially written for the use of shop managers, draughtsmen, foremen engineers and others engaged in turbine construction. The first portion of this volume contains definitions and general principles, including adiabatic and isothermal expansion, kinetic energy, the steam flow through turbines, work done by adiabatic expansion, turbine efficiency, reverse turbines, and the water condensed and power developed in turbines. In Section II. we come to workshop practice, in which the building and turning of rotors is well explained, whilst the balancing of rotors and their bedding is well set out. In Section III. we have a collection of data from actual practice, in which we find particulars of the *Carmania*, the *Mauretania* and the *Lusitania*. Cross-channel steamers are not forgotten, whilst turbine efficiency, with the necessary "finger plate" and "bridge gauge," are well explained. We notice that the Curtis marine turbine is included in this section, with full particulars as to its introduction into the Japanese and the Russian navy. The diagrams and the prints from photographs of these turbines are very well printed and illustrated. In Section IV. we find full particulars of torsion meters, including the Bevis-Gibson torsion meter and the Denny & Johnson torsion meter. The running and up-keep of turbines, which might well be

forgotten in such a text-book, is dealt with so plainly [illegible] whilst the combined running of reciprocating engines and turbines is very well set out. The volume closes with a series of problems in turbine design, in which steam and blade speeds, turbine propeller calculations, and the horse-power developed in blade rows are very carefully gone into.

The Resistance and Propulsion of Ships. William F. Durand. 21/- John Wiley & Sons, New York, and Chapman and Hall, Ltd., London.

THIS book has apparently, in a first edition, been before the public for a period of ten years, and we now have before us a second edition, in which the main contributions of the material available for the discussion of the resistance and propulsion of ships consist of the result of various experimental researches, notably in regard to the operation of the screw propeller. References have also been given here and there to the more important recent contributions to general theory. We find on general examination of the book that, though the calculus is used in the development of the subject, the important results and considerations are discussed in general terms and from the descriptive standpoint, therefore we find that all operations involved in the actual solution of problems are reduced to simple expressions in terms of elementary mathematical processes. The book opens with a very clear description of various forms of resistance experienced by bodies travelling in water, including stream-line resistance, eddy resistance, and surface, skin, or frictional resistance. Eventually we come to wave resistance with excellent diagrams, with the mode of generating waves by the motion of a ship-formed body travelling through the water. We note that the increase of resistance due to shallow water, or to the influence of banks and shoals, is well treated, and this part of the subject is defined by tables giving particulars of various boats and their resistance in pounds at speeds per minute. The question of air resistance is well treated, and the speed is noted at which resistance begins to rapidly increase. We find actual formulæ for resistance very clearly given, oblique resistance not being forgotten. There is a good chapter upon the fundamental problem of propulsion, in which the propulsive action of the element of a screw propeller is well defined, and this chapter finishes with the question of hydraulic propulsion and the screw turbine. Finally, this part of the work deals with the reaction between ship and propeller, and deals with the constitution of the make, and the augmentation of resistance, due to the action of the propeller. There is a special chapter devoted to propeller designs, which is well set out for the ordinary reader, and the question of the best power to propel a ship at given speed is carefully gone into, and the book is finally closed with particulars of trial trips. The work represents substantially all the lectures given by the author on this subject, to his students at the Cornell University.

Mechanical and Marine Engineering Science. A. N. Somerscales. 12/6. James Munro & Co., Ltd., Glasgow; and Simpkin, Marshall, Hamilton, Kent & Co., Ltd., London.

THIS volume is a series of short essays upon what we may term almost elementary principles, but which we find are very useful and suitable for marine engineers, such as are preparing for the Board of Trade Examinations for extra first-class engineers. The knowledge required for these examinations covers an interesting and useful portion of the ground usually included in mechanical as well as marine engineering, and thus the present work is excellent reading for the marine engineer, as well as serving as a hand book for the extra examination. We find the essays on sea water, as well as those on "Eutropy," to be very well put, these latter articles including what is meant by eutropy, followed by others showing eutropy diagrams and the use of eutropy to define the efficiency of engines. The instructions also as to the manufacture of wrought iron, the Bessemer process for steel making, with the alternatives of the Siemens-Martin process, and the cementation process for tool steel making, are most interesting to all readers, and are of such a character that the information is not readily obtained by marine engineers, unless they have been actually occupied in such diverse operations. The softening of water for steam boilers is well considered, and the "hardness of water" is well defined. The balancing of a marine engine is carefully worked up so as to bring an ordinary engineer to appreciate this now general principle, from the first considerations to the final points in the estimation of the balancing in the various engines with four to six cylinders. Then follow solutions of questions in mensuration, with plainly put investigations into momenta and the parallelogram of forces, with clear examples applied to derrick poles, chain slings and the lowering of weights into a ship's hold. An article well worth attention is on riveted joints, after which comes an article on hydraulics, with another on centrifugal force. Finally the book deals with such matters as stability of ships, including their rolling, with a chapter in which questions are given as to the various positions occupied by the vessel with unbalanced weights, and as to the centres of gravity and buoyancy, with calculations as to the meta-centric height. Then a chapter upon latent heat and combustion, with draught of gases, is very well set out, with numerous questions, to all of which answers are, of course, given. Valve diagrams are given in full, and finally the work closes with proofs of rules and formulæ, which are admirable for the student who wants to know.

ICE AND COLD STORAGE ASSOCIATION. [illegible] of this Association was held in the Monica on May 3rd. Presided over by Sir Montague Nelson, who after submitting the loyal toasts which were accorded the usual honours, called upon Mr. Gilbert Anderson to propose "The Colonies and Refrigeration." In the course of his speech he referred to the years before the introduction of refrigeration, when the Colonial farmer relied upon his wool crop almost entirely, the skin hoofs and horns being reckoned as the salable portions of their stock, the meat being either boiled down or used for other purposes. The use of cold stores and the carriage of refrigerated produce had been an immense boon to the Colonies, opening up markets for surplus stock and making it possible to utilize the whole of their animals at remunerative prices. The stock had increased greatly, a new industry had been created which gave employment to many workers, and placed an ample meat supply within the reach of the poorer classes of the Empire. The toast was coupled with the name of Mr. Hall-Jones, High Commissioner of New Zealand, who responded in a patriotic speech which was warmly applauded. He said the capital invested in the refrigerating works of New Zealand amounted to over a million and a-half, and gave employment to quite three thousand workers, while the annual output was about £5,000,000. The growth of the trade had been enormous. Referring to the ties between the mother country and the colonies, he urged that these should be strengthened as much as possible. For instance, a young New Zealander always spoke of coming home when he left the land of his birth for British soil, this feeling was ingrained in young and old; it ought to be fostered, encouraged and reciprocated. The warmth of this feeling had been seen in the spontaneous offer of a war vessel and in the sending to assist the poor and needy of over £2,000, this sum he had received to expend on poor children, as an offering from the workers in New Zealand. The sentiment which evoked such actions should be strengthened on both sides and legislative measures framed with this end in view, and with due regard to imperial policy and tact. Britain had need of the Colonies, and they had need of Britain, each required the other, Britain the key stone of the arch, but, each colony a necessary stone to it, as well for the symmetry as the safety of the whole. Sir Montague Nelson proposed success to the Association. Commenting on the need for and usefulness of the work being done by the association, it was pointed out that the membership might be greatly increased with advantage to all concerned in the important industries connected with refrigeration. The interest taken by so many nations in the Congress, held at Paris, showed that there were fields awaiting development and the International Association which had been formed out of the Congress would tend to foster this, while the next Congress, to be held at Vienna, in 1910, would further widen the interest. His own and the Association's indebtedness to Mr. Leonard, the hon. secretary, for the labour he expended was remarked upon by the President in pleasing terms. Mr. Chas. Page responded, and urged upon the members and visitors the objects of the Association. He welcomed to the dinner their colonial friends and pointed out the importance of the industry with which they were associated.

LAUNCHES AND TRIAL TRIPS.

LAUNCHES—English.

Fabius.—On April 7th, there was launched from the yard of Messrs. G. Rennie & Co., Greenwich, a vessel of novel type, built for service in Southern Nigeria, to the order of the Crown agents for the colonies. The Nigerian railway where it crosses the River Niger will ultimately be joined by bridges, but in addition, the train waggons, six in number, for each load will be ferried across, as the river is two miles wide and subjected to strong and somewhat uncertain currents. The *Fabius* has been specially designed to carry railway waggons, when fully loaded. She is propelled with paddle wheels worked each by separate engines, is double ended, and will carry a full load of about 150 tons upon a shallow draught. The length of the vessel is 160 ft; beam, 33 ft. 6 in.; and depth, 10 ft.; the hull is built entirely of Siemen's Martin steel, galvanised by hot process, and the whole of the decks, cabins, and woodwork are of teak, as is also the accommodation for a number of passengers. The waggons will be brought on board and disembarked whilst the bow of the vessel is secured by a novel arrangement under the patents of Messrs. Baker and Shelford and Messrs. Flannery, Baggallay & Johnson, under whose joint supervision the vessel has been designed and built. There are ballast tanks running fore and aft and divided into numerous compartments to give the vessel stability and to adjust her trim when neither light or loaded. The special arrangements for ventilation and shade are provided against tropical climate, and the whole of the vessel is lit by electricity and is fitted with a powerful searchlight on the upper deck.

Conrad Mohr.—On April 8th, Messrs. R. Craggs & Sons, Ltd., launched from their Tees dockyard, Middlesbrough, the fine steel oil tank steamer *Conrad Mohr*, built for Messrs, Chr. Michelsen & Co., of Bergen, Norway. This vessel is the second oil boat built upon the "Isherwood" system of construction by this firm, and is the fourth ocean going steamer built upon the new system. The dimensions of the vessel are 357 ft. long, 48 ft. beam, 28 ft. 9 in. depth moulded, and is sub-divided in order to form fourteen separate oil tanks. The vessel is fitted with two steel decks with a continuous expansion trunkway in the 'tween decks, and is built to take the highest class with Lloyd's register and Det Norske Veritas, and is designed to carry 6,150 tons deadweight. There are two complete cargo pumping installations of unusual power designed to deliver the cargo into shore tanks in the course of a few hours. Accommodation for ship's company is very commodious and complete in every respect. The machinery, which is to be fitted aft in the vessel, will be supplied by the North-Eastern Marine Engineering Co., Ltd., of Wallsend-on-Tyne, and will have cylinders 25 in., 41 in., 67 in. by 45 in. stroke, steam being supplied by three large single-ended boilers working at 180 lbs. pressure to the square inch.

Paulina.—On April 19th, Sir Raylton Dixon & Co., Ltd., launched from their Cleveland dockyards, Middlesbrough, another of their renowned patent cantilever-framed steamers, specially designed for carrying iron ore from Santander to Glasgow, which they have built to the order of Messrs. Modesto Pineiro & Co., of Santander, Spain. The steamer is being built to Lloyd's highest class, with engines aft, her leading dimensions being 300 ft. by 47 ft. 3 in. by 22 ft. 3 in. moulded, and she will carry about 4,200 tons of cargo on 18 ft. 9 in. draught. 833 tons water ballast will be carried in cellular double bottom and fore and aft peaks, and in addition triangular tanks at the top of each side will contain another 720 tons. The sloping sides of these tanks next to the holds constitute self-trimming arrangement when the ship is carrying coal, as she will do on her return voyages to Santander. The hatchways are of enormous size, as much as 26 ft. wide and 30 ft. long, which will greatly facilitate loading and discharging operations. The holds being absolutely unobstructed by any beams, pillars, webs or stringers are admirably adopted for discharging cargo by means of nineteen derricks fitted with Sieurins patent cargo discharging gear, worked by eight steam winches constructed to Captain Sieurins' latest design. Triple-expansion engines, having cylinders 21½ in., 36 in., and 59 in. by 39 in. stroke, supplied with steam by three large single-ended boilers working at 180 lbs. pressure, will be fitted by the North-Eastern Marine Engineering Co., Ltd., Sunderland.

Aaro.—On April 19th, the launch took place, from the yard of Messrs. Earle's Shipbuilding & Engineering Co., Ltd., Hull, of a handsomely modelled steel-screw steamer, built to the order of Messrs. T. Wilson, Sons & Co., Ltd., Hull, for their passage and cargo service between Hull and Christiania. Having been named *Aaro*, the new steamer glided gracefully into the river, and was taken in tow by tugs to the builders' dock. The dimensions of the ship are: Length, 300 ft.; breadth, 41 ft.; and depth moulded, 20 ft. She is built to the British Corporation Registry's highest class and Board of Trade requirements, having complete awning deck and top gallant forecastle. She has cellular double bottom all fore and aft and peak tanks arranged for water ballast. She will be fitted with two pole masts of steel. There are three cargo holds and 'tween decks forward, arranged for either cargo or third-class passengers. The vessel has silent steam steering gear of Messrs. Amos & Smith's special design, also telemotor gear for working the same, steam windlass and a complete installation of electric light and wireless telegraphy. For the rapid discharge of cargo there are three powerful steam winches and two electric winches. Passenger accommodation is provided as follows: 104 first-class passengers, in one or two-berth cabins; forty second-class passengers, in four-berth cabins; ninety-four third-class passengers, in six-berth cabins aft; and 502 third-class passengers, in 'tween decks forward. The officers and engineers are berthed in the midship deck-house; the firemen in the 'tween decks, alongside the engine casing; and the seamen in the upper 'tween deck forward. Very special attention has been given to all sanitary and heating arrangements. The ship will be fitted with triple-expansion surface-condensing engines, having cylinders 22¾ in., 37 in. and 62 in. diameter by 42 in. stroke, supplied with steam by two large single-ended boilers, working at a steam pressure of 190 lbs. per square inch, and fitted with forced draught; and the very latest improvements for economy in coal consumption and upkeep of machinery have been introduced.

Tintern Abbey.—On April 20th, Messrs. Richardson, Duck and Co. launched from their yard a steel-screw steamer of the following dimensions, *viz.*: Length overall, 284 ft. 6 in.; breadth extreme, 40 ft. 9 in.; depth moulded, 20 ft. 4 in. Gross tonnage about 1,800 tons. Deadweight about 3,100 tons on 17 ft. 6 in. mean draught. This vessel, which has been built to the order of Mr. Frederick Jones, of Cardiff, will take Lloyd's 100A1 class, and has been built under special survey. She is of the single-deck type, with bulb angle frames, clear holds, poop, bridge and top-gallant forecastle. Poop is fitted up for the accommodation of captain and officers, engineers being berthed in steel houses on bridge deck. Cellular double bottom all fore and aft and peak tanks are arranged for water ballast, and equipment includes four steam winches, Cochran's vertical donkey boiler, steam windlass with quick-warping ends, stockless anchors, steam-steering gear, etc., etc. Engines by Messrs. Blair & Co., Ltd., have cylinders 20½ in., 33½ in. and 55 in. by 36 in. stroke, steam being supplied by two single-ended boilers having a working pressure of 180 lbs. A Cochran (Annan) donkey boiler with patent seamless furnace has been supplied and fitted.

Rossano.—On April 21st, Messrs. William Gray & Co., Ltd., launched the handsome steel-screw steamer *Rossano*, which they have built for Messrs. Furness, Withy & Co., Ltd., West Hartlepool. She will take the highest class in the British Corporation Register, and is of the following dimensions, *viz*: Length, 358 ft.; breadth, 50 ft. 8 in.; and depth, 25 ft. 6 in.; with long bridge, poop and top-gallant forecastle. The saloon, state-rooms, captain's, officers' and engineers' rooms, etc., will be fitted up in houses on the bridge deck, and the crew berthed under top-gallant forecastle. The hull is built on the deep bulb angle frame system, with clear holds, cellular double bottom all fore and aft, and large after-peak ballast tank, seven steam winches, double derricks, steam-steering gear amidships, hand screw gear aft, patent direct steam windlass, extra large horizontal multitubular donkey boiler, shifting boards throughout, stockless anchors, telescopic masts with fore and aft rig, and all requirements for a first-class cargo steamer. Triple-expansion engines are being supplied by the Central Marine Engine Works of the builders, having cylinders 25 in., 40 in., 65 in. diameter with a piston stroke of 42 in., and two large steel boilers for a working pressure of 180 lbs. per square inch.

Saga.—On April 21st, the passenger steamer *Saga*, which has been built at Wallsend by Messrs. Swan, Hunter and Wigham Richardson, Ltd., was launched. The vessel is being constructed to the order of the Thule Steamship Co., Ltd., of Gothenburg, and is intended for their service between London and Gothenburg. The *Saga* is 322 ft. in length by 46 ft. beam. She is to be fitted with a set of powerful triple-expansion engines, which are to be supplied with steam by three single-ended boilers. Both the engines and boilers are being constructed at the Neptune works of the builders. The vessel will have room for eighty-four first-class passengers on the lower and main decks amidships, and in a house above. Messrs. Wailes, Dove & Co.'s "Bitumastic" enamel has been applied to the bunkers. As the *Saga* will carry dairy produce, she is fitted with insulated chambers, cooled by refrigerating machinery.

Elite.—On April 22nd, there was launched from the shipyard of Messrs. Cochrane & Sons, Shipbuilders, Selby, a handsomely modelled steel screw trawler, the principal dimensions being 160 ft. by 27 ft. by 15 ft. moulded. The vessel has been built to the order of T. C. Laws, Esq., of Liverpool, for Messrs. Bensaude & Co., Lisbon, and will be fitted with powerful triple-expansion engines by Messrs. Amos & Smith, of Hull, and is replete with all the latest improvements for fishing purposes, including refrigerator, etc. As the vessel left the ways she was gracefully christened *Elite* by Miss Dorothy Allison.

Howden.—On April 22nd, Messrs. Osbourne, Graham and Co. launched from their yard at Hylton, the s.s. *Howden*, which they have specially constructed for the collier trade of Messrs. Furness, Withy & Co., Ltd., of West Hartlepool. The vessel is built on the raised quarter-deck principle, having bridge amidships for accommodation. The vessel is 218 ft. in length, and carries 1,550 tons on a light draught. The steamer is arranged as a self-trimmer, and is classed under special survey with the British Corporation. Water ballast in the double bottom and after peak. The deck machinery is of the most modern description. The vessel is a further addition to the already large fleet of colliers the owners have running in the Continental and British coasting trade. Engines are by Messrs. Richardsons, Westgarth & Co., Ltd., Sunderland, having cylinders 16 in., 27 in., 44 in. by 30 in., and one large boiler 180 lbs. pressure. A Cochran (Annan) donkey boiler with patent seamless furnace has been supplied and fitted.

Dania.—On April 23rd, Messrs. Short Brothers, Ltd., launched from their shipbuilding yard at Pallion, Sunderland, the s.s. *Dania*, built to the order of Messrs. T. Nolson & Sons, of Ghent. The vessel, which will take the highest class at Germanischer Lloyd, is: 260 ft. long, 37 ft. 6 in. beam, and 19 ft. 6 in. depth moulded, and is designed to carry a cargo of 2,700 tons on a moderate draught of water. She is constructed on the deep frame principle, with one deck laid, long poop and top-gallant forecastle, and the fore end is specially strengthened to enable the vessel to steam through ice. Water ballast is provided for throughout the double bottom and in both fore and aft peaks. Five steam winches, steam windlass, steam-steering gear amidships with rods and chains to quadrant, and controlled from standards on upper and lower flying bridges are fitted all driven from a large Cochran (Annan) donkey boiler with patent seamless furnace, in stokehold. Hand-steering gear fitted aft. The propelling machinery is by the North-Eastern Marine Engineering Co., Ltd., of Sunderland, and consists of engines with cylinders 19 in., 31 in., 51 in. diameter with a stroke of 36 in., driven by a large multitubular boiler working at 180 lbs. pressure.

LAUNCHES—Scotch.

Almirante Lobo.—On April 6th, Messrs. Scott, of Kinghorn, launched a steel screw transport steamer, built to the order of the Royal Spanish Navy. The vessel, which is of the awning deck type, was christened *Almirante Lobo* by Miss Devlin, of Granton. The dimensions of the vessel are 255 ft. by 38 ft. by 22 ft. 6 in. to awning deck, and built to the highest classification of Lloyd's. She is fitted with two steel masts and rigged as a fore and aft schooner, and carries two quick-firing guns. A large hatchway has been provided to enable the largest piece of artillery or boilers to be easily shipped, while the after hold has been sub-divided in compartments for the safe carriage of ammunition, shells, etc., an electrically driven series of fans keeping these compartments well ventilated and preventing the spaces from being unduly heated. The vessel will carry a crew of about 100. The 'tween decks have been arranged for carrying 400 troops in hammocks. Triple-expansion engines of the builders' own make and two boilers capable of driving the vessel at a speed of 12 knots have been fitted. The vessel was launched with steam up, and proceeded to Burntisland to take in bunkers prior to running her trial. The vessel leaves for Ferrol in the course of a day or two. Immediately after the launch a cake and wine banquet was held in the office.

Zena Dare.—On April 8th, the Dundee Shipbuilding Co., Ltd., launched from Panmure Yard the trawler *Zena Dare*, built for Captain Arthur Abbey, Cardiff. The vessel is one of the largest trawlers built at Dundee, her dimensions being: Length, 125 ft.; breadth, 22 ft.; depth, 13 ft.; and tonnage, 350 gross.

Mariston.—On April 8th, Messrs. Robert Duncan & Co., Port Glasgow, launched the steel screw steamer *Mariston*, built to the order of Messrs. W. S. Miller & Co., Glasgow. The vessel is of the following dimensions:—Length, 310 ft.; breadth, 46 ft.; depth, 23 ft.; with a deadweight carrying capacity of 4600 tons. The naming ceremony was performed by Mrs. Adam, Shettleston. Triple-expansion engines will be supplied by Messrs. D. Rowan & Co., Glasgow. The *Mariston* is the third vessel Messrs. Duncan & Co. have built for the same owners.

J. O. Crevel.—On April 8th, Messrs. Archd. McMillan and Son, Ltd., Dumbarton, launched the first of two steel screw tug boats, which they have on hand to the order of Sincennes McNaughton Line, Ltd., of Montreal, Canada. The vessel, which is named *J. O. Crevel*, after the president of the company, is of dimensions:—Length, 100 ft.; breadth, 24 ft.; depth moulded, 13 ft. 6 in., and is fitted with engines 18 in. and 36 in. by 27 in. stroke and one boiler, with Howden's forced draught arrangement at 130 lbs. pressure. On deck she has all necessary arrangements for quick handling of vessels under tow, including steam capstan, etc. She has also a steam windlass and steam steering gear. At the forward end of the high casing over engines and boilers is fitted a wheelhouse, and over this a large flying bridge. She has a steel lifeboat, and electric light is fitted throughout. The fore and aft peak tanks are arranged for water ballast, and two heavy oak beltings are fitted on each side. Besides being used as a tug boat, this vessel will be fitted with a large fire pump by Messrs. Merryweather & Sons, Ltd., of London, and fire nozzles will be arranged forward and aft, while on the bridge there will be two monitors capable of throwing water a considerable distance. The second vessel which the builders have on hand for Sincennes McNaughton Line, is of larger dimensions and much greater power, and she will also be fitted with similar fire extinguishing arrangements. Both vessels have been built to the designs and specifications and under the supervision of Messrs. John Reid & Co., of London, Glasgow and Montreal.

Kincorth.—On April 10th, a steam drifter, built to the order of Messrs. Leiper Brothers, Torry, Aberdeen, was launched by the John Duthie Torry Shipbuilding Co., Aberdeen. The dimensions of the vessel are:—Length, 110 ft.; breadth, 20 ft.; depth, 12 ft. The vessel was named *Kincorth*. She will be fitted with triple-expansion engines by Messrs. James Abernethy & Co., Aberdeen.

Bucket Dredger.—On April 17th, Messrs. Ferguson Bros., Port Glasgow, launched a powerful bucket dredger for the Argentine. The vessel, which was floated complete, with machinery on board and steam up, is capable of raising 1000 tons per hour, and has buckets of about 30 cubic feet capacity. A complete awning deck runs the whole length of the ship. The propelling machinery consists of two sets of triple-expansion engines. Powerful winches are fitted at the bow and stern for manipulating the dredging chains, and an improved type of hoisting gear is fitted in the forward hold. Independent engines for hoisting the side shoots are arranged amidships. The naming ceremony was performed by Mrs. Peter Ferguson, Port Glasgow.

Pilot Sibbald.—On April 22nd, Messrs. Bow M'Lachlan and Co., Paisley, launched the steamer *Pilot Sibbald*, the first of two vessels designed and built by them for the Chilian Government. The new steamer is intended for tug and salvage services. For the latter purpose specially strong lifting gear is fitted forward to operate over bow "horn" and crane, and also a powerful salvage pump and other serviceable accessories. Machinery is being fitted on board by the builders. Messrs. Wailes, Dove & Co.'s "Bitumastic" cement was applied to the bottom in engine and boiler space and chain locker, and their enamel to the bunkers, etc.

White Wings.—On April 22nd, Messrs. Russell & Co., Port Glasgow, launched the single-deck steamer *White Wings*, built to the order of Messrs. Norman Hallett & Co., Cardiff. The dimensions of the vessel are :—Length, 330 ft. ; breadth, 40 ft. ; depth, 24 ft. 3 in., with a deadweight carrying capacity of 5400 tons. The vessel, which has been built to Lloyd's highest class, was superintended during construction by Mr. H. A. Williams, Cardiff. After the launch she was towed to the Victoria Harbour, Greenock, where she will be engined by Messrs. J. G. Kincaid & Co.

Unnamed Cargo Steamer.—On April 21st, Scott's Shipbuilding and Engineering Co., Greenock, launched a cargo steamer which they have built to the order of the Gleneden Steamship Co. The dimensions of the vessel are 400 ft. by 52 ft. by 29 ft. 7 in., and she will have a high rate of speed at sea and a large carrying capacity. The arrangements for working cargo are very complete, including nine steam winches and eleven cargo derricks. The decks, awnings, crew space, and other details have been specially designed for service in Eastern waters. The machinery, which will be supplied by the builders, consists of a set of triple-expansion engines having cylinders 27 in., 43 in., 72 in. diameter respectively and a stroke of 48 in. Steam will be supplied by three large single-ended boilers working under forced draught. The ship and machinery have been constructed under the supervision of Mr. John MacKenzie.

Luga.—On April 22nd, the Clyde Shipbuilding and Engineering Co., Ltd., Port Glasgow, launched a steel screw steamer for the Baltic trade of the Stott Line, Ltd., of Liverpool. The vessel is 295 ft. by 42 ft. by 20 ft., and has been constructed to British Corporation highest class, under the superintendence of Mr. T. B. Stott, of Liverpool. The vessel was named *Luga* by Miss Mary Stott, and immediately after the launch was placed in the Company's dock to receive her machinery, which has also been constructed by the builders.

Contramaestre Ortiz.—On May 4th, Messrs. Bow, M'Lachlan and Co.,Ltd.,Paisley, launched the steamer *Contramaestre Ortiz* the second of two steamers designed and built by them for the Chilian Government. The new steamer is intended for service as a tug and salvage steamer. For the latter purpose specially strong lifting gear is fitted forward to operate over the bow "horn" and crane, a powerful salvage pump, and other accessories. Machinery is being fitted by the builders. Messrs. Wailes, Dove & Co.'s "Bitumastic" cement was applied to the bottom in engine and boiler spaces and chain locker, and their enamel to the bunkers, etc. The vessel was named by Mrs. Contreras, wife of Mr. Contreras, of the Chilian Naval Commission.

Aguila.—On May 6th, the steamer *Aguila*, of 2060 tons gross, was launched at Dundee by the Caledon Shipbuilding and Engineering Co. The vessel has been built to the order of Messrs. Yeoward Brothers, Liverpool, and is specially designed for their fruit and passenger trade with the Canary Islands. Miss Yeoward performed the naming ceremony. The dimensions of the vessel are :—Length, 284 ft. 6 in. ; breadth, moulded, 37 ft. 10 in. ; depth, moulded, 20 ft. The vessel has accommodation for about 100 first-class passengers.

LAUNCH Irish.

Atenas.—On [illegible] the Messrs. Workman, Clark & Co. [illegible] launched [illegible] tons gross register, for the Tropical Fruit Steamship Co., Glasgow (Messrs. Clark & Service, managers). The vessel is a sister [illegible] and [illegible] both launched this year and she is intended for the West Indian fruit trade. She will be fitted with accommodation for a large number of passengers. She has been built under the special survey of the British Corporation for their highest class, and both the requirements of the British Board of Trade and the United States steamship Passenger Inspection Service have been fully complied with. The vessel will be fitted with triple-expansion engines constructed by the builders, and is designed for a speed of about fifteen knots.

TRIAL TRIPS.

Mina Brea.—This vessel having been taken on an oil-burning trial on April 2nd, when she obtained a speed of $11\frac{1}{2}$ knots, under loaded conditions, has just been taken for a trial under coal conditions from Greenock to Cardiff, when she made a speed of 12 knots, the consumption of coal being 1·57 lbs. per I.H.P. The vessel was ordered by Messrs. Lane & Macandrew, on behalf of William Keswick, Esq., M.P., of Leadenhall Street, London, E.C., and built under the supervision of Messrs. Flannery, Baggalay & Johnson, of London, Liverpool and Rotterdam. She has been constructed for the petroleum trade, especially with a view to carrying various kinds of oil in one cargo, and has been built to the highest class at Lloyd's and also to conform with the Suez Canal regulations for carriage of petroleum in bulk. Her dimensions are 373 ft. long, 49 ft. beam, and 29 ft. moulded depth. The engines have been supplied by Messrs. John G. Kincaid & Co., Ltd., of Greenock, and have cylinders $25\frac{1}{2}$ in., 42 in. and 69 in. diameter, with a stroke of 48 in., and three large boilers and donkey boiler all fitted to burn oil or coal.

Danubian.—On April 2nd, this vessel which has been built by Messrs. Swan, Hunter & Wigham Richardson, Ltd., of Wallsend-on-Tyne, to the order of Messrs. Lane & Macandrew, 26, Great St. Helens, London for the carriage of petroleum in bulk, was taken for trial at sea, and obtained a speed of 11·245 knots. The *Danubian*, which has been supervised during construction by Messrs. Flannery, Baggallay and Johnson, of London, Liverpool and Rotterdam, is of the following dimensions :—399 ft. 6 in. over all by 51 ft. 6 in. by 30 ft. 3 in., and is to carry 7100 tons of dead weight, and is built to the highest class at Lloyds, and also to fulfil the Suez Canal regulations for petroleum ships. The machinery is of the triple expansion type by the Wallsend Slipway and Engineering Co., Ltd., and has cylinders 27 in. by 45 in. by 74 in. by 48 in. stroke, taking steam from three large single-ended boilers at a working pressure of 180 lbs. A very complete installation of cargo pumping gear has been fitted and the vessel is supplied with steam heating and electric light throughout for quick and efficient handling of the vessel.

Hébé.—On April 6th, the new steamer *Hébé*, built by the Sunderland Shipbuilding Co., Ltd., proceeded on her official loaded trial. The principal dimensions are—257 ft. length between perpendiculars, 35 ft. broad and 17 ft. deep, having raised quarter deck, bridge and topgallant forecastle, built to highest class at Bureau Veritas, under special survey, water ballast is fitted in cellular bottom and also in deep tanks in after hold, the deck machinery consists of four steam winches, steam steering gear, and direct-acting steam windlass. The main engines are by Messrs. The North-Eastern Marine Engineering Co., Ltd., Sunderland, and have cylinders $19\frac{1}{2}$ in., 32 in., and 53 in. by 36 in. stroke, steam being supplied by two large boilers working at a pressure of 180 lbs. per square inch. After proceeding to sea the vessel made several runs over the measured mile fully loaded, when a mean speed of $10\frac{1}{2}$ knots per hour was obtained; after this a continuous speed and coal consumption trial was run, which gave entire satisfaction to all on board, the necessary revolutions were easily obtained without stoppage of any kind.

Warrawee.—On April 9th, the steamship *Warrawee*, built by Messrs. John Reid & Co., Ltd., Whiteinch, after having completed satisfactory trials on the Firth, left for South Australia. The vessel, which has been constructed to the order of The Gulf Steamship Co., Ltd., of Port Adelaide, under the superintendence of Mr. W. J. Woolnough, of Govan, will be employed on their passenger and cargo service on the South Australian Coast.

Magdalena.—On April 22nd, the steel screw steamer *Magdalena*, built by Messrs. Craig, Taylor & Co., Ltd., Stockton-on-Tees, to the order of A. C. Lensen, Esq., of Terneuzen, was taken to sea for her trial trip, which proved highly satisfactory. The vessel is of the following dimensions, *viz.*:—298 ft. by 44 ft. by 21 ft. 1 in. depth moulded. She is built of steel to the highest class in Lloyd's registry, under special survey, of the single-deck type, and has water ballast in double bottom fore and aft, and in peaks. She is equipped with patent steam windlass with quick warping ends, steam-steering gear, five steam winches, suitable donkey boiler, screw gear aft, pole masts, electric light throughout, and all modern improvements. The machinery has been constructed by the North-Eastern Marine Engineering Co., Ltd., the cylinders being 21 in., 35 in., 57 in. by 39 in., with two large steel boilers working at 160 lbs. pressure. During the run from Hartlepool Hough to Souter Point everything worked with the greatest smoothness, and a speed of close upon $11\frac{1}{2}$ knots was maintained. The owner, Mr. A. C. Lensen, and Mr. W. C. Carter, of London (superintendent engineer), both expressed themselves as being highly pleased with the ship and engines. After the trial trip the vessel proceeded to Wallsend-on-Tyne under command of Captain Jibben.

Vasari.—On April 22nd, the steamship *Vasari*, the largest and finest passenger steamer ever built on the river Tees, left her builders yard for trial trip and to proceed on her maiden voyage to New York. She has been built by Sir Raylton Dixon & Co., Ltd., of Cleveland Dockyards, Middlesbrough, to the order of Messrs. Lamport & Holt, of Liverpool, for their mail and passenger service between New York, Brazil and the Argentine Republic. She has been specially designed to meet the requirements of American passengers on this line, which requirements are of a very high-class character, and consequently have had to be carried out in a style equal to the best Atlantic liners. The vessel is 502 ft. by 59 ft. 4 in. by 30 ft. 3 in. deep, with a very large deadweight and capacity measurement. She has been built to the highest class of the British Corporation under special survey. Quadruple engines of large horse-power and large double ended boilers working at 230 lbs. pressure have been supplied by Messrs. Richardsons, Westgarth & Co., Ltd., Middlesbrough. During the trial trip the vessel attained a speed of 15 knots three-parts loaded. The steamer has been built under the supervision of Capt. Bird, the owner's marine superintendent, and Mr. John Dall, their superintendent-engineer, assisted by Mr. T. W. Shrigley, and Mr. E. A. Weaver, also Mr. Saunders, chief of the stewards' department.

Patella.—On April 28th, this vessel, which has been built by Messrs. Swan, Hunter & Wigham Richardson, Ltd., Wallsend, for the Anglo-Saxon Petroleum Co., Ltd., London, under the superintendence of their marine department, underwent her official liquid fuel trial. She was taken for oil fuel trial at sea on the 28th April, when a speed of $11\frac{3}{4}$ knots was attained on the measured mile. The coal fuel trial took place on the 6th of May, a speed of about $12\frac{1}{4}$ knots being attained. The vessel is fitted with all the latest improvements in tank steamers, including Meyer's well-known liquid-fuel burning system. The propelling machinery, which has been constructed by the Wallsend Slipway and Engineering Co., Ltd., consists of a set of triple-expansion engines, with cylinders $26\frac{1}{2}$ in., 43 in. and 72 in. diameter and 48 in. stroke, and three single-ended boilers working at a pressure of 180 lbs. per square inch. On the trial the vessel easily exceeded her contract speed and gave every satisfaction to Mr. Meyer and Mr. Stephens, who represented the Anglo-Saxon Petroleum Co., Ltd. Mr. Crehan, representing Messrs. Flannery, Baggallay & Johnson, Mr. C. Stephenson, representing the builders, and Mr. G. Campbell, representing the Wallsend Slipway and Engineering Co., Ltd., were also present at the trial.

Kairaki.—In early May the twin-screw steamer *Kairaki*, built by the Dublin Dockyard Co. for the Kaiapoi Shipping and Trading Co., Kaiapoi, New Zealand, ran trials on the Clyde. The trials proved satisfactory in every respect, and a mean speed of 10 knots was maintained for several hours. The principal dimensions of the vessel are:—Length, 160 ft.; breadth, 28 ft. 6 in.; and moulded depth to main deck, 10 ft. 6 in. She is of the raised quarter-deck type, with top-gallant forecastle, and long bridge, and has been built under Lloyd's special survey and to their highest class, as well as to the requirements of the British Board of Trade and New Zealand Shipping Acts. The *Kairaki* has a deadweight carrying capacity of 220 tons on the very shallow draught of 6 ft. 8 in. and 550 tons on Lloyd's freeboard. The machinery, which has been supplied by Messrs. Ross & Duncan, of Glasgow, consists of two sets of triple-expansion engines.

Keywest.—On May 3rd, the steamer *Keywest*, a steel screw vessel which has been built by Messrs. Swan, Hunter and Wigham Richardson, Ltd., Wallsend-on-Tyne, for the Canadian Lake trade, was taken out to sea for her trial trip. The vessel, which is 250 ft. long by 42 ft. 6 in. broad, has been built under the survey of the British Corporation for the B.S. Class, for service on the Great Lakes and St. Lawrence river. The engines have been built by the North-Eastern Marine Engineering Co., Ltd., Wallsend. On the trial trip the vessel attained a speed of $8\frac{1}{2}$ knots per hour under very unfavourable conditions. The keel of this steamer was only laid on Feb. 15th.

Telconia.—On May 4th, the steamer *Telconia*, a cable steamer which has been built by Messrs. Swan, Hunter and Wigham Richardson, Ltd., at their Neptune Works, to the order of the Telegraph Construction and Maintenance Co., Ltd., of London, ran her trial trip. The vessel is 220 ft. long with a breadth of 31 ft., and has been built under Lloyd's special survey to the 100 A1 class. There are two large cable tanks. The *Telconia* is fitted with twin-screw engines of the triple-expansion type capable of driving the vessel at a speed of 12 knots. These engines, together with the boilers, have also been constructed by Messrs. Swan, Hunter and Wigham Richardson, Ltd. The trial was entirely satisfactory.

Rio Grande do Norte.—On May 4th, the *Rio Grande do Norte* (Captain Bento Machaddo), the fifth of the ten destroyers ordered from Messrs. Yarrow, Glasgow, for the Brazilian Government, ran a successful official full-speed trial trip on the Skelmorlie mile, attaining the contract speed of 27 knots easily. The trial was under the supervision of Captain Bartholomew Da Silva and Captain Rosauro de Almeida, who were highly satisfied with the result.

Kingswear.—On May 8th, the new steel screw steamer *Kingswear*, built by Messrs. Wood, Skinner & Co., Ltd., Bill Quay-on-Tyne, to the order of Messrs. Renwick, Wilton and Co., Dartmouth and Torquay, left the Tyne for her official trial trip. This vessel, which has been constructed to the requirements and under the special survey of Lloyd's for their highest class, carries about 2150 tons deadweight. The propelling machinery, which has been constructed at the Northumberland Engine Works, Wallsend, of Messrs. The North-Eastern Marine Engineering Co., Ltd., consists of a set of their latest type of triple-expansion engines having cylinders 19 in. by 31 in. and 51 in. with 51 in. stroke, steam being supplied by two large steel boilers working at a pressure of 180 lbs. per square inch. During the trial run the machinery worked perfectly throughout, a mean speed of $10\frac{1}{2}$ knots being easily maintained.

Itapuca.—On May 18th, the twin-screw steamer *Itapuca*, built by the Ailsa Shipbuilding Co., Ltd., at their Troon yard for Messrs. Cia Nacional de Nevecacao Costeria, Rio de Janeiro, ran her official steaming trials on the measured mile at Skelmorlie. The vessel is a sister ship to the T.S.S. *Itajuta*, built by the Ailsa Co. last year, and is of the following dimensions:—270 ft. B.P. by 42 ft. beam by 18 ft. 6 in. moulded. The carrying of fruit being a special feature of the trade for which the vessel is intended, a large compartment has been insulated for that purpose. The machinery, also constructed by the Ailsa Company, consists of two sets of triple-expansion engines, as follows:—Cylinders 16 in., by 26 in. and 42 in., stroke 30 in., two marine boilers 15 ft. 6 in. by 11 ft. 6 in., and a donkey boiler 10 ft. 6 in. by 10 ft. The vessel has been fitted out in the most modern manner for a steamer of this description, the following gear being noticeable:—Refrigerating plant by Messrs. J. & R. Hall, Ltd., fire extinguishing apparatus by the Clayton Fire Extinguishing Co., Ltd., electric light and ventilation by Messrs. Claud Hamilton, Ltd., and hydraulic cranes by Messrs. Brown Bros. & Co. On the mile the vessel attained a mean speed of 13 knots per hour, which is one knot over that contracted for, and this was considered most satisfactory by the owners' representative.

BOARD OF TRADE EXAMINATIONS.

NOTE—1C denotes First Class; 2C Second Class.

March 20th, 1909.

Adams, E. W... 2C Glasgow
Akeroyd, T. W C 2C W. Hart'l
Andrew, A. M. J. 1C Liverpool
Barnes, O. T .. 2C London
Bowman, H. H. 1C N Shields
Brownless, J. R 1C Liverpool
Catterson, C. C. 1C Cardiff
Charlesworth, J 1C Liverpool
Ching, J. T. L. 2C N. Shields
Clapham, J. .. 2C W. Hart'l
Corkery, J. .... 2C W. Hart'l
Coulson, Robt. 2C W. Hart'l
Curry, C. H. .. 2C W Hart'l
Dimmick, J. .. 1C Glasgow
Dudgeon, S. .. 1C N. Shields
Fraser, John .. 2C Glasgow
Gatt, P. H. .... 1C London
Gaunt, T. C. .. 2C W Hart'l
Gothe, Otto G. 1C W. Hart'l
Gough, H. N... 2C Cardiff
Harrower, F. .. 2C Glasgow
Howe, H. V. .. 2C London
Hughes, A. T. 1C Cardiff
Humphreyson, C 1C Liverpool
Irwin, L. ...... 2C Glasgow
Jones, Morgan 2C Cardiff
Lane, W. W .. 1C Cardiff
Lawrence, H G 2C London
Lewis, James .. 2C Cardiff
M'Fee, Wm .. 1C London
M'Gregor, C. M 2C Glasgow
M'Intosh, J. S. 1C Glasgow
Macsween, Alex 2C Glasgow
Mearns, S. C... 2C London
Millar, Robt. .. 2C Glasgow
Naysmith, W. G. 1C Glasgow
Needham, R. F. 2C N Shields
Philp, J. H. .. 1C London
Robertson, J .. 1C Leith
Robinson, S. A. 2C N Shields
Roe, Alex. J. .. 2C Glasgow
Rutter, S...... 2C London
Spence, W. L 2C Leith
Steven, W .... 2C Glasgow
Sturgeon, J. O 2C N. Shields
Thomson, T. H. 2C Glasgow
Urquhart, W .. 2C Leith
Wallace, R. G. 1C Liverpool
Walmsley, C... 2C Liverpool
Walter, J. C. .. 2C South'ton
Warwick, G. .. 2C N. Shields
Watson, J. W. 2C Glasgow
Watt, A. ...... 2C N. Shields
Wilson, J. W... 1C Liverpool
Winn, C. A. B. 2C Cardiff
Wolsey, Edwd. 1C Cardiff

March 27th.

Allen, James .. 1C N Shields
[illegible], Robt. H 2C Hull
Bowie, Jas. H. 2C Liverpool
Brooks, W. H 1C Hull
Bruce, John G. 2C Aberdeen
[illegible], J. B. 1C Aberdeen
Cadger, R. .... 1C Aberdeen
Calder, Robt... 2C Greenock
Campbell, A. .. 2C Greenock
Cudbird, L. J. 2C London
Dale, G. T. V. 2C London
Davis, Geo. A. 2C Liverpool
Drake, F. B. .. 2C London
Emery, Edgar J. 2C Liverpool
Falconer, J..... 1C N Shields
[illegible] ... 1C Liverpool
Gibson, Edwd. 2C Liverpool
Grav, Rich. A. 2C Liverpool
Griffith, Thos. 1C Liverpool
Jackson, Wm... 1C N. Shields
Johnson, C. C. 2C Greenock
Johnson, J. H. . 2C Hull
Jones, Edwd. J. 2C Liverpool
Kell, A ...... 2C N Shields
Lumley, Wm... 2C Bristol
Lusted, B. .... 1C Bristol
M'Killop, P. .. 2C Greenock
M'Laren, R. H 2C Sunderl'd
Mallett, E G... 1C Bristol
Mason, John T. 1C Sunderl'd
Metcalf, G. W 1C Hull
Millen, Archd. 2C Greenock
Moffitt, T. E... 1C Sunderl'd
Moffray, H. L. 1C Liverpool
Neasham, J. M 1C Sunderl'd
Owen, Arthur.. 1C Liverpool
Oxenham, W. E. 1C London
Pile, James E 2C N. Shields
Plowman, W. E. 2C London
Redpath, A..... 1C Hull
Richardson, W. 2C London
Ross, R. A..... 1C N. Shields
Rush, John .... 1C Sunderl'd
Turner, Wm. .. 1C N. Shields
Wylie, Archd... 2C Greenock
Zagraphos, P... 2C London

April 3rd.

Adamson, D. M. 1C Glasgow
Alexander, D... 1C Glasgow
Anderson, John 2C Glasgow
Atkinson, John 2C Glasgow
Bell, A. E. J. .. 2C Cardiff
Bissett, Wm. .. 2C Glasgow
Buntain, Robt. 2C Glasgow
Calder, Alex. .. 1C Leith
Carmichael, A. 2C Glasgow
Carter, Henry 2C N. Shields
Clay, W. J..... 2C Cardiff
Colquhoun, G. 2C South'ton
Fordham, A. G. 2C London
Grey, James A. 2C N. Shields
Griffiths, T. J. 1C Cardiff
Hamilton, A. .. 1C Glasgow
Hanson, J. A. 2C South'ton
Hepburn, Alex. 1C N Shields
Kemp, A. H. .. 1C Glasgow
Kirkup, J. R. .. 1C N. Shields
Kynock, H..... 1C Liverpool
Lister, H. .... 2C Glasgow
Low, John .... 1C Glasgow
M'Cullock, A. 1C Liverpool
M'Lead, John .. 2C Cardiff
Maund, G. T. 2C Cardiff
Nordberg, J. A. 2C N. Shields
Olsen, O. G. .. 1C Leith
Parker, A. F. .. 1C Glasgow
Paterson, J. A. 2C Glasgow
Pickering, W... 2C Glasgow
Reay, Thos. M. 2C N. Shields
Richards, D. G. 2C Cardiff
Robertson, G... 2C Glasgow
Rosser, W. .... 1C Cardiff
Saunders, C. W 1C London
Stables, W. H. 1C Leith
Stenhouse, J. A. 2C N. Shields
Stewart, John 2C Belfast
Sumner, Geo... 1C Liverpool
Sweet, G. V. F. 2C Cardiff
Thoms, Geo. H. 2C Liverpool
Tulloch, Jas. .. 2C South'ton
Walker, C E .. 1C Liverpool
Wallace, H. .. 1C Belfast
Whitton, J..... 1C Glasgow
Wilde, John R. 2C Glasgow
Wilson, J .... 1C Glasgow
Woodhouse, O. 1C N. Shields

April 10th

Atkin, John.... 2C N. Shields
Banks, A. E. .. 2C N. Shields
Bodley, Geo. .. 1C N. Shields
Bracewell, T. W. 1C Liverpool
Clark, Jas. .... 2C N. Shields
Courthops, H. 1C N. Shields
Dadswell, P. .. 1C London
Dunn, Robt. .. 1C N. Shields
Evans, D. L. .. 2C Liverpool
Evans, Hugh .. 2C Liverpool
Holmes, T. A. 2C Liverpool
Hyland, Edwd. 2C Liverpool
Little, J. R..... 2C N Shields
Marten, F. S... 2C Liverpool
Martin, Henry 1C Liverpool
Mills, Phillip .. 2C N. Shields
Moore, R. R. .. 1C N. Shields
Newman, A. .. 1C London
Parsonson, G. W. 2C London
Potter, Oscar .. 2C Liverpool
Ross, R. M. .. 2C Liverpool
Scarrow, R. R. 1C Liverpool
Sherriff, W. .. 2C Liverpool
Tanner, W. W. J. 2C Liverpool
Thomas, A .... 1C Liverpool
Wallace, W. E. 2C N. Shields

April 17th.

Bruce, F. T. .. 1C N. Shields
Brunton, J. H. 1C Dundee
Catt, F. V. .... 1C London
Colquhoun, J... 2C London
Cowie, J....... 2C Liverpool
Cromar, W. S. 2C N. Shields
Dickinson, J. L 2C N. Shields
Dood, J. ...... 1C Liverpool
Erickson, G. M. 1C N. Shields
Forbes, J. .... 2C N. Shields
Gunn, A....... 2C London
Hale, H. ...... 2C N. Shields
Jones, R. F. .. 2C London
Lambert, H. .. 2C Hull
McGuinness, J. E. 2C Greenock
Mackay, J. A... 2C Dundee
Mackie, D. F. 2C London
Maclean, N. A. 2C N. Shields
Millar, F. E. .. 2C London
Miller, R. .... 2C Liverpool
Morgan, E. B. 2C N. Shields
Moyes, A. B. .. 1C Greenock
Richardson, R R. 1C N. Shields
Richmond, W A. 2C Hull
Roberts, S. L. 1C Liverpool
Rounthwaite, H. 2C London
Rowe, A. E. .. 1C London
Scott, W. J. .. 2C Greenock
Steel, Edwin .. 2C Hull
Tellesson, W. G. 1C Liverpool
Wellard, C..... 1C London
Westerberg, P. A. 2C N. Shields
White, W. .... 2C N Shields
Wilson, C. G... 1C N. Shields
Wright, C. A. H. 2C N. Shields
Young, D. H... 1C Dundee

April 24th.

Adams, T. D. .. 2C London
Alexander, T. W. 2C Glasgow
Blenkey, T. H. 1C W. Hart'l
Bowen, J. V. .. 1C Cardiff
Boxall, E. W... 1C South'ton
Brayshaw, J. G. 1C W. Hart'l
Campbell, H. .. 2C N. Shields
Colquhoun, W. 2C Glasgow
Cooper, G. A. 2C Cardiff
Corlett, G. H. 1C Liverpool
Coutts, J. K. .. 1C Liverpool
Cox, Arthur B. 2C Cardiff
Dale, L. D..... 2C London
Davidson, A. L. 2C London
Davies, J. H. .. 1C W Hart'l
Doe, John D. .. 2C Barrow
Edwards R. S. 2C Cardiff
Enright, E..... 1C W. Hart'l
Forrest, R. B... 2C Glasgow
Fraser, A. E. .. 2C N. Shields
Galbraith, J. A. 2C Glasgow
Gibbald, W. .. 1C Glasgow
Gresswell, A. W. 1C South'ton
Henderson, W. J. 2C Cardiff
Harrison, J. .. 1C W. Hart'l
Holdsworth, .. 1C Liverpool
Holmes, S. E. 2C South'ton
Hood, F. G. .. 2C South'ton
Houston, H. V. 1C Cardiff
Howes, G. A. .. 1C London
Lillico, J....... 1C W. Hart'l
Lindsay, R. A. 1C London
Livingstone, J. 2C Glasgow
Lonie, R....... 2C W. Hart'l
MacAdam, R. 2C Glasgow
M'Donald, C. K. 1C Leith
M'Farlane, J. .. 2C Glasgow
M'Kenzie, J. A. 2C Leith
Macheath, J .. 2C Glasgow
Marsh, H G... 1C Liverpool
Mavor, G. .... 2C London
Munro, G. .... 2C Glasgow
Nicoll, A. R. .. 1C Leith
Perry, G....... 1C Glasgow
Phillips, A. B. 2C London
Rankeillor, J. .. 2C Leith
Rutherford, C. F. 1C Leith
Scarrow, R B. 1C Liverpool
Simpson, A. .. 2C Glasgow
Smedley, C. S. 1C Liverpool
Smith, B. J. .. 1C Liverpool
Soutar, R. .... 1C W. Hart'l
Spencer, J. K. 1C W. Hart'l
Stein, R. R. .. 1C W. Hart'l
Stevenson, J. B. 2C Glasgow
Thom, Alex. .. 1C Glasgow
Wanless, J. F. 2C N. Shields
White, J. .... 2C Glasgow
Whyte, W. B. 1C Glasgow
Wilson, W. R... 1C W. Hart'l

TRAVEL AND SPORTS EXHIBITION.—The Marconi Company are providing a novelty at the exhibition to be held at Olympia in July. A receiving and transmitting station will be erected at either end of the building, where wireless messages may be sent to and received from large steamers at sea. The Company will also transmit messages from one side of the building to the other at the dictation of any visitors. Operators will be present to explain the system of wireless telegraphy.

The British Legation in Mexico reports that arrangements are being made for the establishment of a line of steamships between Progresso, Yucatan and New Orleans. The company undertake to perform not less than three voyages a month. They will be permitted to engage in the coasting trade between Mexican ports.

The Marine Engineer
And Naval Architect.
LONDON, JULY, 1909.

NAVAL RESERVE DECORATIONS.

IT is a matter of satisfaction that at last the Admiralty have issued regulations governing the award of decorations to officers of the Royal Naval Reserve and the Royal Naval Volunteer Reserve, instituted some time ago by His Majesty, and the regulations for the award of a good-conduct and long-service medal to men belonging to these forces. Although gratification will be felt by some, we feel sure that, as the regulations at present stand, others will experience keen disappointment that they are left out in the cold. With reference to officers of the Royal Naval Reserve the decorations may be conferred on commissioned, executive and engineer officers borne on the active list whose total commission service is at least fifteen years, but time served in honorary rank will not count. The executive officers must have had twelve months' naval training in the fleet and have attained the rank of lieutenant. Engineer officers must have had an instructional course at home dockyards and attained the rank of Engineer R.N.R.; Staff Paymasters and Paymasters R.N.R. who have rendered special service in promoting the interests of the Reserve may, at the discretion of the Admiralty, be granted the decoration if they have completed twenty years' service, including time with honorary rank. Then comes a regulation having a most serious limiting effect, according to which the decoration will not be awarded to any officer whose name was removed from the active list prior to January 1st, 1908. We cannot believe that this regulation will be allowed to remain as it is, on reconsideration, and it is the duty of the Admiralty to see that the regulations are based on equitable grounds. Why should an officer who retired on January 1st, 1908, be in a better position than one who retired on December 31st, 1907? Their term of service—in each case twenty years, for example—is practically the same, only one day difference, and their work in the service of the country identical, each having borne his burden with honour and credit. In contradistinction to this drastic regulation is one by which officers otherwise qualified who have not undergone training, but who have performed specially good service, may, at the discretion of the Admiralty, be specially granted the decoration. We have no objection to this elastic provision, for we think its existence serves to emphasize the necessity of the revision of that relating to service termination. Officers of the Royal Naval Volunteer Reserve must have served twenty years, but not continuously. Service in various capacities is allowed to count in making up the twenty years.

The award of a long service and good conduct medal to men of the Royal Naval Reserve may be granted to seamen and stokers enrolled for the first time on and after April 1st, 1906, who satisfactorily complete fifteen years' service, with eight periods of naval training, and have entered their final period of service and are assessed no lower than "very good." Time served in the Royal Navy will not be allowed to count. The medal will also be granted to all other R.N.R. men serving on January 1st, 1908, who satisfactorily complete fifteen years of service with drill or training required during that period. Members of the Royal Naval Volunteer Reserve may be granted a medal for long service after twelve years' service in the Volunteer or Territorial Forces, including service from the age of seventeen in a Cadet Corps or Cadet Battalion of the Army Volunteers. The service need not be continuous, but only that as an "efficient" will be allowed to count. Service with the Regulars will not count, but all service with the Auxiliary Forces will count, provided the last five years have been served in the Royal Naval Volunteer Reserve. We are glad to think that the services of officers and men of the British Mercantile Marine are at last to be recognised by the issue of these decorations, not for special acts of daring in moments of emergency, but for long continuous service, in a manner creditable to themselves and honourable to the profession to which they belong.

ROYAL COMMISSION ON SHIPPING "RINGS."

ON the 2nd of last month the reports of the Royal Commission on Shipping "Rings" and Conferences were issued. It will be remembered that this Commission was appointed on November 30th, 1906, to inquire into the operation of shipping "rings" or conferences generally, and more especially into the system of deferred rebates, and to report whether such operations have caused, or are likely to cause, injury to British or Colonial trade, and, if so, what remedial action, if any, should be taken by legislation or otherwise. Although the appointment of the Commission was so long ago, it must not be forgotten that its object was not only an important one, but the interests involved were very wide-spread, and, therefore, its scope and investigation was extensive, and the inquiry was necessarily deep in order to test the substantiality of the caustic criticism which had been levelled against shipping conferences in general, and deferred rebates in particular. The result of this Royal Commission is a majority report with certain reservations by two of its signatories, and is signed by eleven of the Commissioners, while the minority report is signed by five of the Commissioners Two of the Commissioners did not sign the report at all, owing to their compulsory absence from the sittings of the Commission. There is little difficulty

in coming to the conclusion that, as the Commission proceedings were in progress, the case against the shipping owners was materially changed, owing to the breaking down of the allegations made by the opposite side, and we are not surprised that the Commissioners did not see their way to suggest any legislative alterations. The majority of the Commissioners are of opinion that it is neither practicable nor desirable to invest any external body with power to fix rates of freight by compulsion, and, apart from such question of desirability, the grant of such a power would only be justified if the State were prepared to grant shipping conferences, statutory monopolies or guarantee their profits. The Commissioners are not prepared, as we expected, to recommend any alteration of what has hitherto been regarded as the settled policy of the country, *viz.*, that the sums paid under the postal contracts should merely cover the service in carrying the mails. This is an important decision, as it clearly negatives the idea that the mail contracts should be utilized for the purpose of the oppression of shipping. The Commissioners recognise that certain abuses in the conference system can be remedied by counter-combination on the part of the shippers, which will give the latter power of collective bargaining, and they express the opinion that in this direction Chambers of Commerce are not capable of satisfactorily dealing with the matter. It is suggested that the Shippers' Association should be representative of all the shippers sending goods on a given route, and, with a view of making this Association as representative in character as possible, it is suggested that, when formed, it might apply to the Board of Trade for registration. If, after examination, it is found that the Association is of an adequate representative character the Association would be registered by the Board of Trade as the body entitled to confer with the Conference Lines on behalf of the whole trade in regard to shipping matters. It is pointed out that care should be taken to enable Colonial Governments interested to have such representation as will ensure that the interests of the producer and the consumer may be reasonably safeguarded. Lord Inverclyde, one of the Commissioners, while signing the majority report, qualifies his adhesion to it by the statement that the grievance as to the non-publication of qualification and classification is more imaginary than real, as in some trades rates are seldom altered, while in others they are frequently altered, and he believes that it is best for shipping traders to get and give quotations as required. With reference to the supervision by the Board of Trade, he does not approve of this principle, because for one reason he agrees that it will not be possible for a shipping conference absolutely to disregard reasonable proposals put forward by a body representative of all their customers, but as the recommendation in regard to the interference is of a limited character he does not think that he would be justified in not signing the report on account of it. Lord Inverclyde desires to emphasize more strongly than the report does, the large amount of British capital invested in shipping which works under the Conference and deferred rebate system, and that if it were not for the security this system gives, it is very doubtful if the investment of that capital would be risked, and, consequently, doubtful if British shipping would maintain and develop its position in the world which it does in the face of growing and increasing foreign competition. Mr. Maddison, another Commissioner, while signing the report, also makes the reservation that the system under review as regarded by him on the whole is undesirable, but the results revealed by the evidence are not of a character to warrant State interference in the business methods of a great industry. There are, however, elements of danger which may develop, and these need to be carefully watched by the Board of Trade. The Commission, with the Right Hon. Arthur Cohen, K.C., as chairman, are deserving of the thanks of the community for their labours, although the net result is rather in the direction of showing that there was not so much wrong after all, in fact it was a case of much cry and little wool, judging it from the ordinary standpoint of practical commercial procedure.

INSTITUTE OF MARINE ENGINEERS.

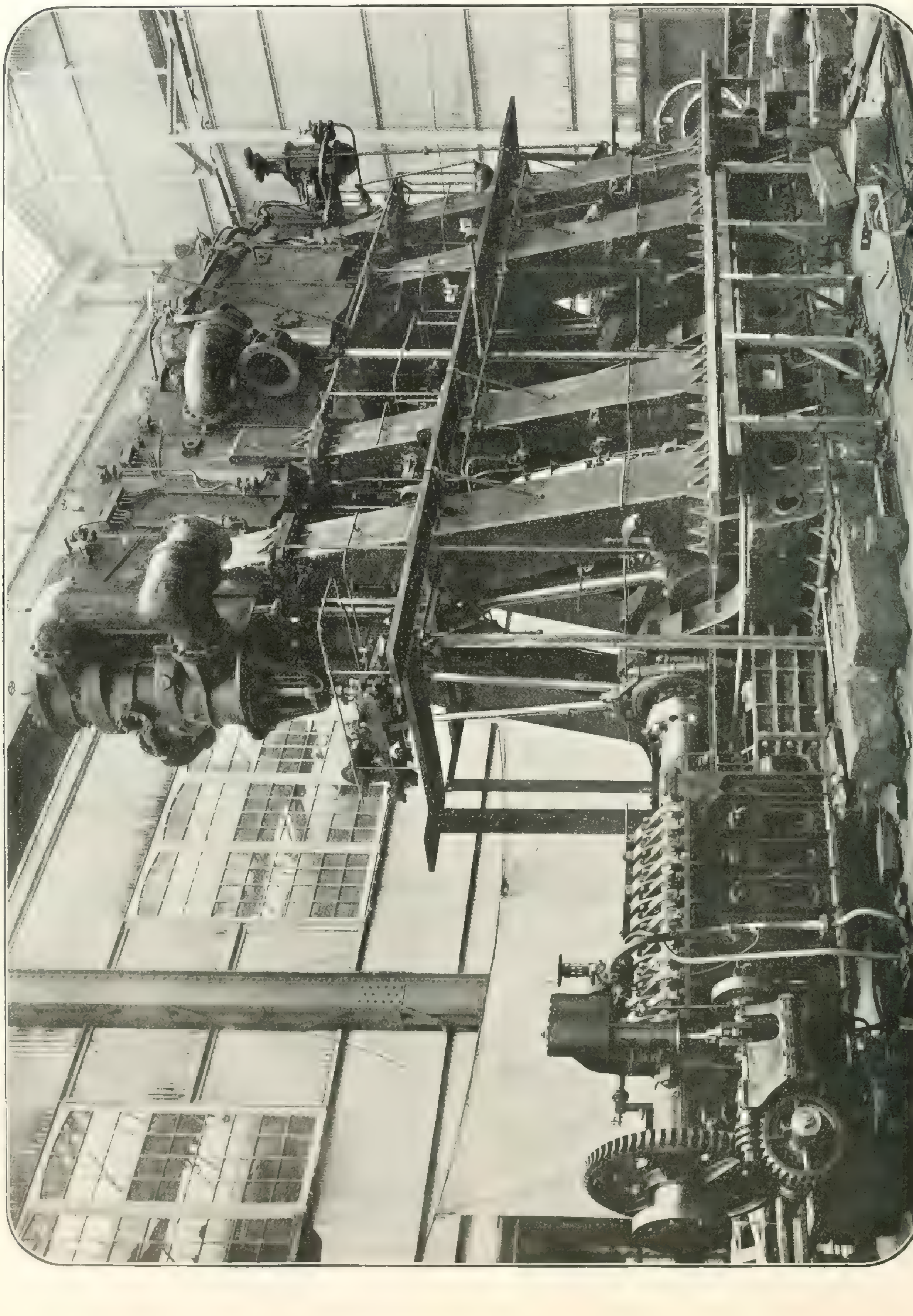
A Visit to Trinity House.

On Saturday, June 19th, the members of the Institute of Marine Engineers paid a visit to Trinity House, Tower Hill, the centre from which the Brethren of Trinity direct their valuable operations for the safeguarding of shipping around these islands. The building was erected in the year 1794; the constitution of Trinity House, however, dates from the year 1514, in which year a charter was granted by Henry VIII. giving considerable powers, including maritime legislation, shipbuilding, the provision of storehouses for arms, ammunition, etc., but in later years its work has been chiefly confined to the control of pilotage and the upkeep of lighthouses, lightships, buoys, etc. Some time ago it was made a department of the Board of Trade, but it occupies the somewhat anomalous position of being at once a Government department while retaining the privileges of a private corporation, and its connection with the prosaic legislative body has not altered its customs or constitution which are still reminiscent of the days when England first took its place as mistress of the seas. The present Master of Trinity, a position generally occupied by a Prince of the Royal Family, is H.R.H. the Prince of Wales. There are twenty-four Elder Brethren, of whom eleven are honorary and thirteen acting members, and an unlimited number of Younger Brethren. The acting Elder Brethren must be officers who have attained the rank of commander and have had command of a ship of war at sea for at least three years if in the Royal Navy, or must have served in command at sea on foreign service for four years if in the mercantile marine. No special qualification is necessary for the Younger Brethren, a position entirely honorary and involving no duties, but in practice only persons connected with the Royal Navy or the merchant service are ever chosen.

The subjects which excited the greatest amount of interest among the visitors were the very fine models of lighthouses and lightships. The splendid collection included models of the Eddystone, Smalls, Wolf Rock, Needles, Maplin and other well-known lighthouses, also a model of the Roman "pharos" in the grounds of Dover Castle, one of the earliest lighthouses known. The collection of buoys in the entrance hall includes

1.—Promenade on Boat Deck.
2.—Boat Deck.
3.—1st class Promenade Deck.

4.—Entrance Hall.
5.—Music Room and Library.
6.—1st class Dining Saloon.

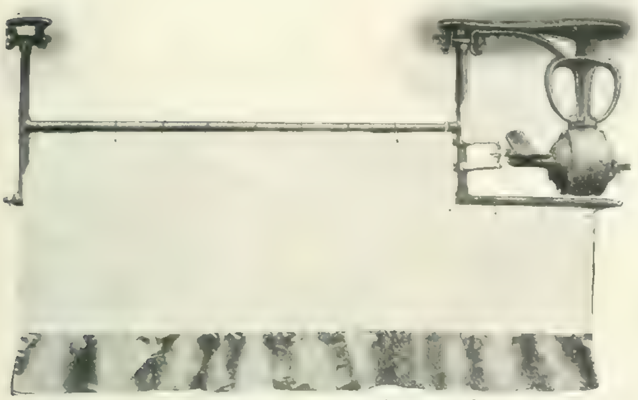


Engines of the "Orsova."

dance with the terms of the mail contract extensive. The machinery installed for this purpose is of rather a costly type. It is of the very latest pattern, and apparently the contractors are of a mind to make the most of the traffic.

The *Otway* has run her trials and the *Osterley* is expected soon to begin her official tests.

We give several illustrations of the *Orsova*. In another issue we shall refer to various firms' specialities on the Orient liners.



The Bandy Electric Punkah.
See "Orient Liners."

LLOYD'S REGISTER.

New Rules for the construction of Steel Vessels.

NOW that the new rules are completed there can be no harm in saying that they were much overdue. The old rules had become not only cumbersome and involved, but it was latterly a task of some difficulty to adapt them to the progress of shipbuilding. Neither Lloyd's Register nor its able technical staff was, of course, to blame for this. On the contrary they showed a real desire to accommodate shipowners and shipbuilders within the authority of the regulations, and very often Mr. Cornish and his associates succeeded by broad-minded interpretations of the provisions in making us forget that the basis of the rules had become hopelessly undermined by age. The defect of the old rules was that they had outlived the assumptions on which their original framing proceeded. One has only to recall the progress that has been made in mercantile shipbuilding since they were drawn up in 1870 to realize that, and in realizing the truth the conclusion becomes inevitable that if they had been re-written on a new basis in the mid-eighties, when the Freeboards Committee recommended, we should have been much better off to-day. The load line question would not have been in the tangle it is, for one thing, because the committee expressed the opinion then that the questions of draught and strength were practically the same. That, of course, is the conclusion on which the Freeboard Tables are based; but as the standard of strength is Lloyd's rules for 1884-5, we are not exactly where we should be.

Shipbuilding Pioneers.

While it is right to praise Lloyd's Register for its courage in at last breaking away from the 1870 basis, it is only fair to admit that other registration societies, notably the British Corporation, have pioneered the movement. The development of the spar, awning and shelter-deck types of steamers, by re-distributing the material, strengthening the topsides, and making the top deck the strength deck was a work with which the British Corporation was closely identified from 1890 onwards. As a matter of fact, in no direction is Lloyd's breaking absolutely new ground. Undeniably, conservatism in a registration society is an excellent quality, but it can be obviously overdone. Henceforth the rules are only to contain provision for full scantling vessels, and vessels with continuous superstructures like awning or shelter decks. There is a relief in that classification for which the shipbuilder will, no doubt, be duly grateful. Until the new rules are out it is difficult, of course, to say much about the rules. Even then it will be wise to wait until they have been tried before definitely expressing an opinion on them. But the industry is bound to be deeply grateful for the prospect of greater simplicity, which the circular announcing their completion shows.

Computing the Frame Number.

One good thing which is promised is that the half girth of the midship section is no longer to be used in computing the frame number. The frame number is to be the sum of the moulded depth at the middle of the length of the vessel and the greatest moulded breadth. The plating number is to be obtained by multiplying the frame number by the length, as at present. The proportions of length to depth are to be taken to the uppermost continuous deck, and in the way of a long bridge to the bridge deck, making the side plating of uniform thickness up to the strake below the bridge sheerstrake, which sheerstrake for the length of the bridge becomes the main sheerstrake of the vessel. The dimensions of the frame are to be determined by using the frame number in association with the depth from the lowest tier of beams to the top of the floors. This arrangement obviously makes unnecessary the introduction of tiers of beams at certain specified depths of ship. These facts are, of course, taken from the circular on the subject issued by the society. The frame spacing, as indicated by the same document, errs naturally on the safe side; but if rumour speaks truly there are concessions of note in the Double Bottom Tables. Rules for the construction of oil-tank steamers are also promised. As these will presumably embody the results of the experience gained by the society in its survey of the tankers sent into commission within recent years they ought to be valuable. Whether the people who have specialized in oil-tank construction will think so, remains to be seen.

The Decimal System.

Some exception has been taken to the abolition of divisions of one-twentieth of an inch in favour of divisions of one-fiftieth, or ·02 of an inch. Of this change the circular says: "It will not only simplify the work of the Drawing Office and of the Counting House, by reason of the recognised superiority of the decimal system, but it will also serve to bring the British measurements into almost identical correspondence with those adopted by our continental neighbours. It so happens that ·02 of an inch is to all intents and purposes half a millimetre." No doubt, these things are perfectly true. Moreover, it conceivably helps Lloyd's Register in its dealings with foreign, particularly continental, shipbuilding to use the decimal system. But there is point in the rejoinder made, that in Great Britain, at any rate, the use of fortieths would have achieved the same end with less disturbance of the existing practice. The British Corporation uses fortieths, and the steel makers—who will be obliged to change now, of course—use twentieths. It would be unfortunate if Lloyd's are making the change merely to suit their own convenience. However, the point is small, and it would be foolish to press it, considering how great the concession is which the rules stand for. The new rule book will mark the beginning of a new era in mercantile shipbuilding, and Mr. Cornish, Mr. Thearle and their colleagues are to be congratulated on it. If it has been long in coming they are not blameworthy. Nor are the General Committee to be blamed, for to err on the side of safety is a good failing of a registration society. In any case let us rejoice that a great simplification of the conditions imposed upon mercantile shipbuilding has been achieved, and bend ourselves without prejudice to make the most of it.

Cardiff Channel Dry Docks.—The annual meeting of the Cardiff Channel Dry Docks and Pontoon Company, Limited, was held at Cardiff on June 7th. Mr. John Cory, who presided, said a final dividend of 4 per cent. was now recommended, making 7 per cent. for the year, and also 4 per cent. to those shareholders of the Bute Dry Dock Company who transferred to the Channel Dry Docks for six months ended March 31st, leaving £59,254. to be carried forward. He considered the results highly satisfactory, having regard to the state of shipping generally. The report was unanimously adopted.

THE FLEETS OF THE MAIL LINES.

(From our Own Correspondent.)

The Event of the Month

has assuredly been the loss of the Cunarder *Slavonia* on the Lecolona Rock off the Island of Flores in the Azores. The vessel struck at 2.30 in the morning, in thick weather, and seems to have rapidly become a total loss. How she got to the position in which she met with her end remains to be seen. But the accident seems to have been a sufficiently serious one and probably it was only the rigour of Cunard discipline that preserved what has so often been characterised as Cunard luck—in that the disaster was entirely unattended with any loss of life. For the vessel, having struck on a sunken rock, rapidly settled down, and soon lay with the water up to her hatches. Nor was the position an easy one for the dealing with the large number of persons whom she was carrying from New York to the Mediterranean. Nevertheless, the emergency was met. The passengers were landed in boats at the village of Largents, and at first the crew remained with the ship, though she lay at the foot of steep cliffs, said in one report to be a thousand feet in height. A gale setting in, however, it became inadvisable for the men to remain on board, and they were landed by hawsers and blocks. Though there was no loss of life, as I have said, the saloon passengers seem to have lost that portion of their baggage which was stowed in the hold. They were, however, delayed but a short time on their voyage, for once again the invention of Mr. Marconi showed its value in case of trouble. The operator on board the *Slavonia* sent up his cry for aid—as did Mr. Binns of the *Republic*—and like him he soon got responses. Two big steamers heard the signals and hastened to the scene of the disaster. One of these was the twin-screw liner *Prinzessin Irene* of the Nord-Deutscher Lloyd Company, which, like the *Slavonia*, was on her voyage from New York to the Mediterranean, and on her were bestowed the 110 saloon passengers whom the wrecked steamer carried. The other was the Hamburg-American *Batavia*, which found accommodation for the 300 intermediate and steerage passengers who also found themselves stranded on the island. It would seem that the position of the *Slavonia* as regards the aid which her Marconi apparatus afforded her in this crisis was essentially different from that in the case of the lost White Star liner *Republic*. The *Slavonia* found wireless telegraphy a matter of infinite convenience in calling to and arresting two passenger steamers which carried forward her passengers with the utmost promptitude. But that was all. In the case of the *Republic*—as my readers will assuredly remember—vessels were called to the rescue in time to take passengers and crew off a sinking ship, and thus it was effective in avoiding great loss of life. Apparently the Cunard captain, with the assistance of his officers and crew, had already safeguarded the passengers' lives entrusted to the flag when the first of the German vessels appeared on the scene.

The details of the *Slavonia* may be briefly mentioned. She was a twin-screw vessel of 10,606 tons gross register, built for the British India Steam Navigation Company in 1903 by Sir James Laing & Sons, of Sunderland. Her name originally was *Yamuna*. In February, 1904, when the Cunard Company began the extension of its traffic between Austro-Hungarian ports and New York, they acquired two extra ships. One of these was the vessel just lost—they then renamed her *Slavonia*—and the other was the *Pannonia*, which is still running. It may be added that it is a long time since the Cunard Company had any serious accident to any of its fleet, the last total loss being that of the twin-screw liner *Carinthia*, wrecked on the coast of Hayti when carrying mules from New Orleans to South African ports for the use of the War Office. This vessel was a sister to the *Sylvania*, which is still in the fleet and, like her, was designed for the trade between Liverpool and Boston. I should add that in this case also there was no loss of life. There, too, curiously enough, a Hamburg-American liner appeared on the scene and did remarkably well financially out of the business, for the master of the *Carinthia*, believing that his ship might be pulled off the rocks, asked the captain of the German liner to make the attempt. The latter said that his price for assistance was a large sum—I think it was a thousand pounds a day—and before he would do anything the captain of the *Carinthia* had to put his hand to a document agreeing to the terms on which he insisted. The attempt desired was made—and was not successful—though operations continued over some days. Though the *Carinthia* became a total loss, the Hamburg Company put forward a claim on the terms embodied in the agreement. The Cunard Company pointed out that there had been nothing salved and that, therefore, as they maintained, no salvage was payable. Litigation followed. In the event the Courts decided against the British company on the ground that the claim was based, not on salvage, but on a contract for towage, which was good against the owners of the towed vessel, irrespective of whether the work was successful or not. This being so the Hamburg-American people made a good thing out of the *Carinthia* case, and if the member of Parliament for one of the Cheshire divisions who asked a question in the House of Commons on the 17th June about the succour given to the wrecked passengers of the *Slavonia* by the Hamburg liner *Batavia* had known anything about this incident, his question might possibly have been framed in a different fashion.

The "George Washington."

On Sunday, the 13th June, I had the opportunity of seeing the new Nord-Deutscher Lloyd liner *George Washington*, which was calling at Southampton on her maiden trip between Bremen and New York. The afternoon was brilliant, and we on the tender had an excellent opportunity of gauging the magnificent proportions of the new liner as she came rapidly towards us off Netley. In general appearance she is of the *Adriatic* type, having four raking pole masts and two funnels, with a tremendous superstructure of deck-houses. She is the biggest vessel ever built in Germany, and indeed the biggest afloat save the great Cunarders, her gross tonnage being about 27,000 tons. Her length is 722 ft. 5 in., beam 78 ft. and depth from the upper saloon deck 78 ft. Her draught is 33 ft. She has no less than eight decks, of which five run the whole length of the vessel. Amongst her appliances for safety and convenience of navigation are an installation of wireless telegraphy, a complete system of Stone-Lloyd water-tight bulkhead doors, submarine bell receivers, and bilge keels to minimise rolling. Fire alarm bells are also fitted throughout the vessel. She is intended to be of moderate speed and economical in her working. Her contract speed is thus but 18½ knots, though she exceeded that guarantee by a full half-knot on trial and maintained her nineteen knots during a portion of the trip down the North Sea. Her quadruple-expansion engines were fitted by her builders, the Vulcan Company of Stettin. They indicate about 20,000 h.p. Accordingly she burns not more than 350 tons a day, which is probably about one-third of the amount consumed by the present holders of the record. The weight thus saved in engines, boilers and bunkers enables her to carry some thirteen thousand tons of cargo and thus to earn a considerable freight, when sufficient cargo is offering for transport. The idea of her owners has been to offer to travellers a large and steady ship with ample space, not merely in the public rooms, but also in the private cabins and state-rooms. Throughout the accommodation the 'tween decks are very lofty and ample space is indeed afforded to all classes of passengers. The decoration of the saloon, which is large enough to seat some 470 persons at one time, is characteristically German. The same might be said of the smoke-room, with its heavily carved and nearly life-size figures adorning the companion. There is a large lounge where smoking is allowed, and where thus ladies and gentlemen can foregather. The holly wood in which the cabinet work in this department is executed is somewhat noticeable, as indeed is the stained glass of the dome, which is ventilated by bronze open-work stars with opal centres containing electric lights. This must give a singularly beautiful effect at night when the room is fully lighted up. The arrangement of the state-rooms and cabins de luxe is extremely good, and the design of the furniture remarkable. Many of the wash-hand stands for example—which in the principal rooms have hot and cold water laid on—are fitted into cases which are modelled on eighteenth-century French designs. In others semi-circular wardrobes mask the basins and their fittings. I was particularly struck with one little luxury to which Herr Heinecke, the new managing director, drew my attention

with some pride. In the big hanging wardrobes were fixed small electric lights for the purpose of enabling the passenger to choose the clothes he would wear without the possibility of any mistake. The second and third-class accommodation is in every way comfortable and indeed luxurious, and the ship provides everything that can be thought of for all classes of passengers and her large crew. Her complement will be 565 saloon in 263 rooms, 433 second-class in 137 rooms, 452 third-class in 160 rooms, and 1226 steerage passengers in open berths. As the officers and crew number 627 persons her total population will be 3303 persons as a maximum. The third-class passengers have their saloon smoke-room and ladies' rooms. To secure the promenades from discomfort in heavy weather the fronts of the deck are glazed, and these strong glass screens are carried a considerable way aft down the bulwarks on each of the passenger decks. Altogether the vessel is one of which her owners may well be proud, and from which they may well hope in normal times to see a handsome return for their expenditure and forethought.

The Advantages of Wireless Telegraphy

have so impressed themselves upon the management of the P. & O. Company that their last three steamers of the "M" class—the *Morea*, *Mantua* and *Malwa*—have been fitted by them with Marconi installations, although as yet there are no land stations in Australia. It would appear, however, that there are a good many stations from which messages can already be sent to the ships on their usual voyages, whilst, of course, they can always speak when within range with other fitted vessels either at sea or in port. There are, for example, a dozen or more in the Mediterranean and Adriatic seas, including one at Port Said, which will, of course, be largely used by these vessels. Then there are others at Aden, the Andaman Islands and Calcutta, and one is under contemplation at Colombo. Further East there seem to be more again, the coasts of China, Japan, and even Formosa, as well as the Philippine Islands, being provided with them.

Public Yachting.

Speaking of these ships it may be noted that the *Malwa* is at present, with the *Vectis*, engaged in the public yachting business of the P. & O. Company. I notice, too, that the *Dunottar Castle*, one of the reserve mail steamers of the Union-Castle line, has just gone to Messrs. Cammell, Laird & Co.'s yard at Birkenhead to be overhauled before taking the place of the ill-fated *Argonaut* in a similar adventure. Messrs. Cammell, Laird & Co. have, by the way, booked an order for a new twin-screw steamer for the Isle of Man trade. This vessel is to be used for the winter traffic and will thus not have the speed at which the turbine engine is found most economical. But I believe that for their faster traffic the Isle of Man Company continues to find the invention of Mr. Parsons more and more satisfactory. For that reason I cannot quite understand why the General Steam Navigation Company should have gone back to the paddle for their new excursion steamer, the *Golden Eagle*. But the ways of the Thames are past finding out. Thus

The London County Council

has disposed of three more of its steamers, reducing the total left in its possession to twenty-one. Though the vessels cost from £5000 to £6000 each about four years ago, from £900 to £1000 seems to be all that they can hope to realize for the sale of the better craft in the fleet.

The White Star Liner

Megantic sailed on her maiden voyage from the Mersey to the St. Lawrence on Thursday, the 17th June. She is an exact sister to the *Laurentic*, placed on the service earlier in the season, save that she has ordinary twin screws driven by quadruple-expansion reciprocating engines in place of the mixed installation of reciprocating and turbine engines, which is demonstrating its good points in driving the triple screws of the earlier vessel.

New Docks at Middlesbrough

Dry Docking at Middlesbrough. The accommodation for dry docking vessels at Middlesbrough has been considerably improved of late. There was much need for improvement, and the want has been met by the enterprise of Messrs. Smith's Dock Co., Ltd., who have built two docks with appliances which, since completion in February, have been kept well occupied—adding to the convenience of the shipowners, as well as rewarding the enterprise of the firm. So many steamers now proceed from continental and other ports to load at Middlesbrough that it is a great convenience to be able to enter dry dock on the way up the Tees and afterwards proceed to the loading berth ready to receive cargo. One dock is 550 ft. and the other 450 ft. in length, while the sills are so arranged that vessels can be placed in dock at all states of the tide. An electric travelling crane to lift 25 tons is one of the useful appliances between the two docks, so designed that the jib can plumb the centre of each and lift weights which can be carried to the railway trucks for despatch to any part of the country, whether cargo or defective machinery, for repair. Recently the new twin-screw steamer *Vasari*, 502 ft. long, and the twin-screw steamer *Athinai*, 420 ft. long, were placed in the docks about

the same time, while the *Manchester Exchange* passed up the river under the stern of the *Vasari*, an experience which showed that the width of the river at the dock gates is sufficient to avoid risk of damage to vessels, and to save any interruption of traffic in the fair-way while the process of placing a steamer in dry dock is under way. The rudder of the *Sado Maru*, found to be defective when in dry dock, was lifted out by the crane and despatched to the forge for repair, the work necessary in this case being greatly expedited by the facilities provided. Since the docks were opened forty-four vessels have been dry docked, and to many of these important repairs have been executed, involving dry docking one steamer when loaded and discharging cargo by the electric crane to get at the damage.

H.M.S. "SAPPHO" IN COLLISION.

IN a dense fog off Dungeness on Saturday night of the 19th of last month the cruiser *Sappho* was rammed on the port side by, curiously enough, a steamer of the same name, belonging to the Wilson Line, Hull. The cruiser was badly damaged and had a narrow escape of foundering, and eventually had to be run aground in Dover Harbour. The following is the official account of the disaster issued by the Admiralty on the 20th June.

"Wilson Line steamer *Sappho*, of Hull, was in collision with H.M. second-class cruiser *Sappho* last night in a dense fog off Dungeness. Merchant steamer uninjured and proceeded on her voyage. No lives lost or anyone injured. Damage to H.M.S. *Sappho* necessitated her being grounded in Dover Harbour. Salvage operations have commenced and no difficulty is anticipated in floating her."

It appears that the *Sappho* was making slow progress up Channel, the weather being very thick, when the Wilson Liner loomed up close to the cruiser. Everything was done to avert a collision, but only a minute or so passed before the liner crashed into the cruiser on the port side in the vicinity of the engine room, an extensive breach being made below the water line in the stokehold. The seas rapidly pouring in flooded the engine room and extinguished the fires. Tugs were despatched to the sinking vessel, and it was due to the prompt arrival of the *Lady Crundall* and the valuable assistance rendered by her and the other tugs that the cruiser was prevented from foundering.

The *Sappho* is a twin-screw protected cruiser of the second class, of 3,400 tons, with a complement of 273 men. She is attached to the Home Fleet, and was launched in 1891. Her captain is Commander Harold Christian.

We give an illustration of the damage done to the cruiser. She has recently been able to proceed to Chatham, where she will be dry docked for repairs.

WHITE STAR CADET SHIP "MERSEY."—Great interest has been shown locally in the return of the White Star Line's training ship, *Mersey*, which returned to Liverpool at the beginning of June, after a voyage to Australia and back. She will sail again on a similar voyage on the 15th of this month, but during the comparatively short time she has been in Liverpool a large number of alterations and improvements have been carried out, which include a complete electric lighting installation throughout the ship, and better housing accommodation for the cadets. She has been painted white all over, presenting a very fine appearance, and the fact that the scheme has been a successful one is proved by the large number of applications which have been received by the White Star Line for apprenticeship on board the *Mersey*, and she will sail on her next trip with a full complement of sixty cadets, instead of forty as on the last voyage.

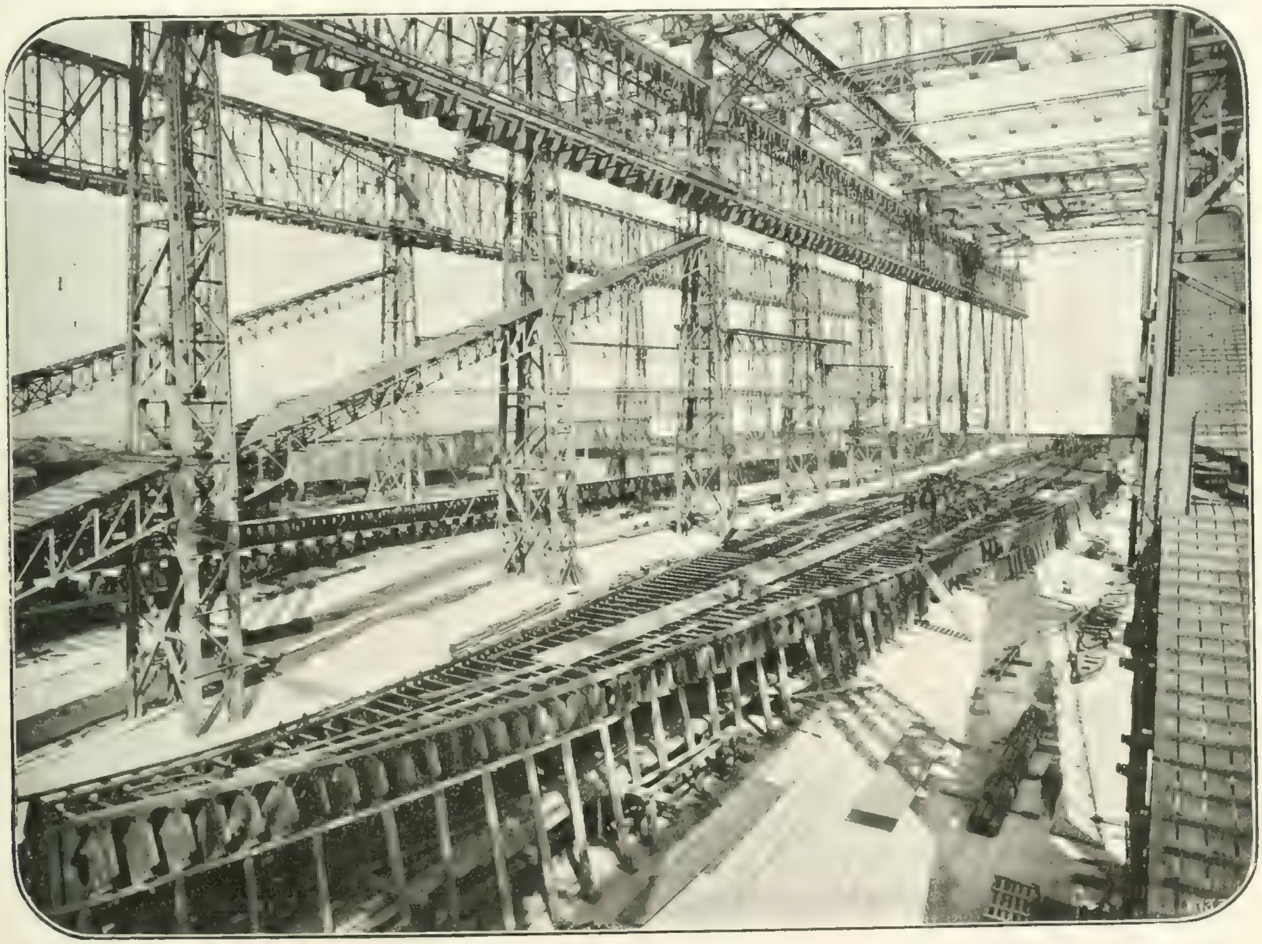
THE WHITE STAR LINERS "OLYMPIC" AND "TITANIC."

THE progress being made with the construction of these gigantic liners at Belfast is now becoming more evident, as shown by the accompanying illustration. The work on the *Olympic* is the further advanced, the slip on which she is laid down having been the first ready for the builders. The framing of the cellular double bottom is already complete, and the bottom shell plates and tank intercostals are being fitted and hydraulic riveted. The tank top plating is also being proceeded with. A notable feature in the construction of these vessels is that the whole of the shell plates to the upper turn of bilge will be riveted by hydraulic power.

The work at the *Titanic*, on the adjoining slip, is also making interesting progress, the hydraulic riveting of the keel centre plate (or vertical keel) nearing completion and the erection of the floors in the double bottom having been commenced. It will be observed also that the wing tank floors are lying on the berth ready for erection.

The illustration gives a very good view of the gantries and the hydraulic riveters that are suspended from the travelling frames. These appliances perform a very important part in the work of construction; each riveter, weighing over seven tons, can be moved to any desired position over the entire length of the structure with the greatest facility.

Amongst other interesting appliances that may be observed on the building berths are the portable oil furnaces for heating the rivets. The liquid fuel is sprayed in the furnace by compressed air, great heat being generated in a very short time and well distributed over the furnace. These oil furnaces are a great improvement on the old type—in fact, everything that ingenuity can devise has been called into requisition in the construction of the steamers, and the strength of the structures will greatly exceed anything at present afloat.



Work on the *Olympic* and *Titanic*.

THE WOERMANN LINE.—H. M. Consul at Rotterdam states that, according to a report in a local shipping paper, the Woermann Line, who for some time past have maintained a regular service of five sailings per month from Rotterdam to Africa, will extend their sailings to six per month.

THE "BERLIN."—The steamship *Berlin*, which has been built by the Weser Shipbuilding Company, of Bremen, for the New York-Mediterranean service of the North-German Lloyd, is by far the largest vessel built at Bremen, which is thirty-five miles—of comparatively shallow navigation—from the mouth of the river Weser.

A NEW STEAM PUMP.

We have pleasure in drawing the attention of our readers to a new design of pump embodying some novel features in the arrangement of the suction pipe and valves, with a view of enabling the pump to be run at a high speed and at the same time ensuring absolutely silent working of the valves.

A further point aimed at is to make a pump capable of drawing water from a considerable depth, as it has been found in practice that it is desirable that the suction valve of a pump should be placed at least 21 feet above water level without interfering with its efficient working, thus enabling the pump to be placed in a position where it is readily accessible, without the necessity of lowering the pump should the water-level vary.

Messrs. A. & P. Steven, of St. James Road, Glasgow, and of Manchester and London, who are manufacturers of this new type of pump, when contemplating the production of such an article as to comply with the requirements above described, carefully investigated the causes which lead to objectionable knocking of the valves and other strains which occur in pumps.

It was found in practice that the main objections to most of the pumps of known design consisted in the fact that considerable friction was encountered when the water was drawn from great depth.

A large column of water, measured from the level of the water up to the suction valve, requires to be accelerated and stopped after every stroke of the pump, and the said acceleration and the stoppage of the water column prevents the valves opening and closing correctly with each stroke, unless the speed is kept comparatively slow.

It is necessary to dimension the suction valve so that it will take the whole strain involved in stopping this column of water in motion at the end of the suction stroke.

The water in flowing along the water passages is not properly guided, and in finding its way through the suction pipe to the suction valve through the pump chamber undue amount of friction is created through cross currents, thus appreciably affecting the efficiency of the pump.

We are able to give our readers the opportunity of following the line of development adapted by the manufacturers by reference to the adjoining diagrams, of which Fig. 1 is a diagrammatic representation of a pump constructed in accordance with the new method, while Fig. 2 represents a horizontal pump partly in section, showing the actual position and construction of the novel features.

In order to overcome the objections set out above various improvements have been introduced which will be readily appreciated by reference to the illustrations.

To overcome the considerable friction when drawing water from a great depth guide-vanes are introduced into the suction pipe, while the column of water, measured from the level of the water up to the suction valve, is kept in perpetual motion and no stopping occurs at every stroke of the pump. To attain this end it is arranged that while the suction valves are closed (that is, during the pressure period) the flowing of water in the suction pipe is utilized to raise the water as high as possible above the suction valve, the water always flowing in the direction which it is ultimately expected to take—namely, through the suction valves.

The static pressure of this column of water, which is raised above the suction valves, assists the atmospheric pressure to force the water into the pump chamber during the suction period.

In this way the losses in the pump are reduced to a minimum, and such losses as remain are distributed equally over the suction and pressure period. By this arrangement it will be seen that the acceleration in the stopping of the water column after every stroke of the pump is obviated, consequently the speed of the pump can be materially increased owing to the fact that the suction valve is entirely relieved.

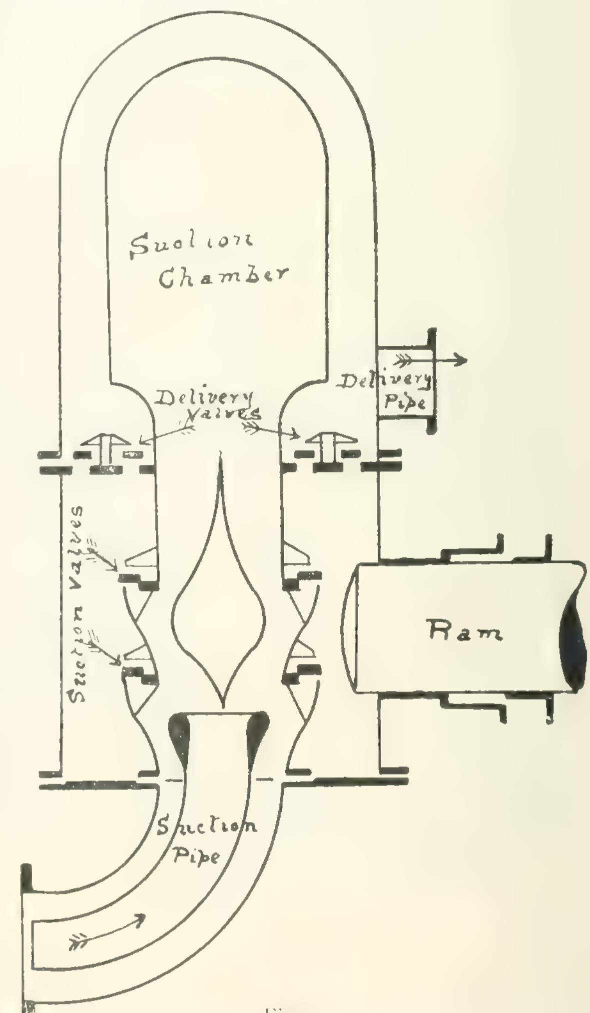


Fig. 1.

As the suction valve is not now required to take the whole strain involved in stopping the column of water at the end of the suction stroke, it can be kept considerably lighter, while the friction losses and cross currents are entirely avoided by the provision of guide-vanes, which guide the water close up to the suction valves.

The diagrammatic view in Fig. 1 shows the general arrangement of the suction pipe, suction and pressure valves, air-suction chamber, pump chambers and the plunger. This illustration, in conjunction with the

above description, will enable the method of obviating the knocking of the valves to be readily understood, and the reason why the pump can be run at a high speed.

The illustration of the pump in Fig. 2 shows how the method is carried out in a practical manner in an actual machine, and no further description is necessary to enable this illustration to be clearly understood.

Rexine for Ships Upholstery.—A new substitute for leather, under the title of Rexine, is being put on the market by The British Leather Cloth Manufacturing Co., Ltd., of Hyde, near Manchester. It is claimed that this material is not only indistinguishable from leather but is one-fourth the price ; it wears longer and better than leather, and it does not peel or crack. It is antiseptic in character and at the same time is waterproof, vermin-proof, stain proof and scratch-proof under ordinary wearing conditions a special point in its favour being that the material is washable. Special attention has been given to the production of a leather substitute for ships upholstery, cushions and similar requirements for state cabins, saloons and similar purposes for use afloat—from the smallest motor boat to the largest liner. It is important to note that Rexine is most applicable for tropical climates, as it is unaffected by heat, cold or atmospheric exposure, therefore it is specially suitable for export. The material is manufactured in various qualities, in various colours and with various leather grains.

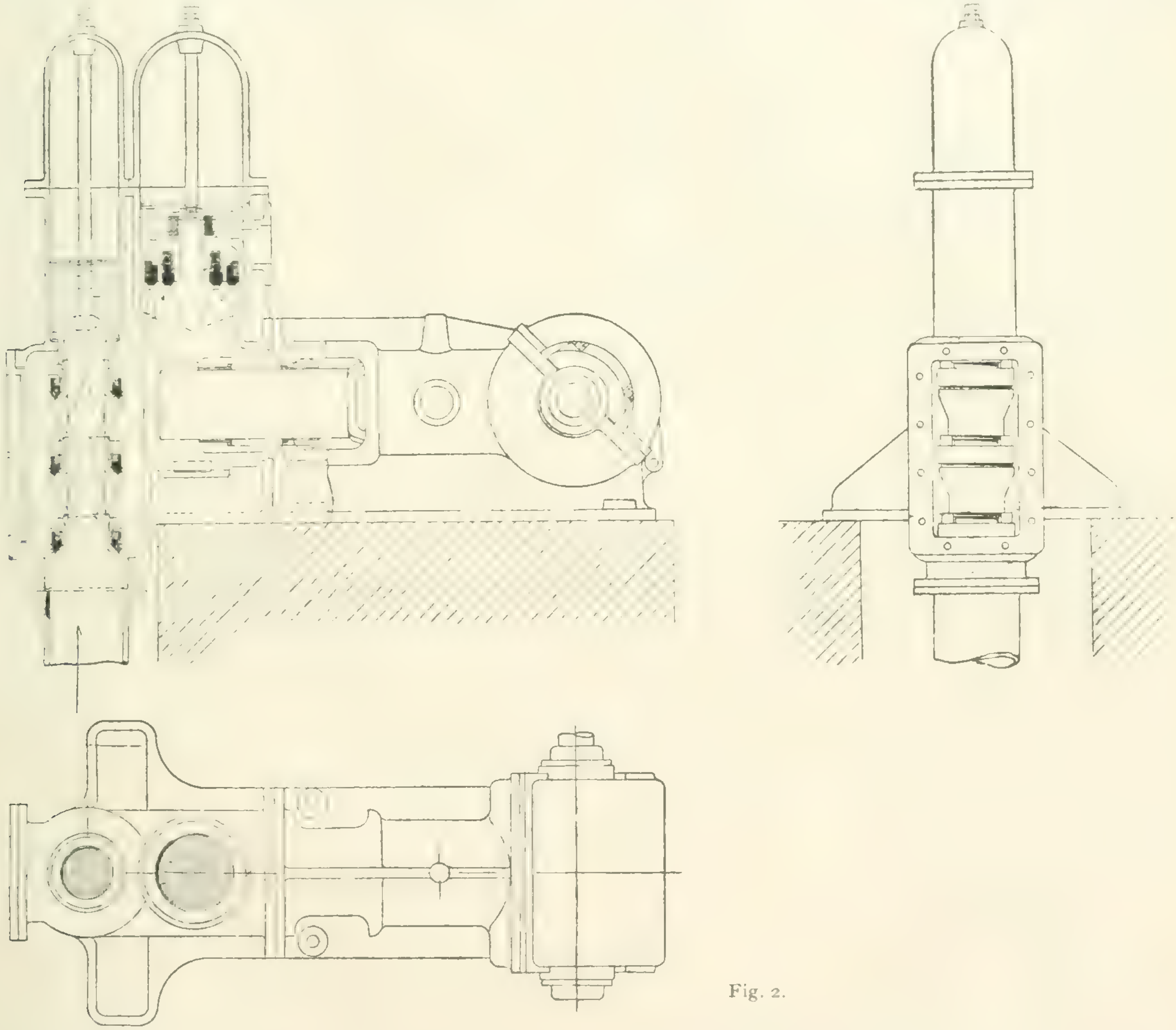


Fig. 2.

NAVAL MATTERS—PAST AND PROSPECTIVE.

(From our Own Correspondent.)

Portsmouth Dockyard.

IT is unnecessary to dwell at length upon the review at Spithead on June 12th. Suffice to say that the colonial press delegates spent a most interesting day and were afforded a splendid sight. There were 144 vessels, comprising the First and Second Divisions of the Home Fleet with the Atlantic Fleet, including destroyers, submarines and auxiliary vessels. In addition to inspecting the fleet the delegates witnessed an attack on the *Dreadnought* by destroyers and submarines and a realistic attempt to land on Whale Island, the invader being routed. The combined fleet left Spithead three days later for the manœuvres, which commence on June 28th and last three weeks. The cruiser *Indomitable* will be detached from the First Cruiser Squadron on June 25th to return here in readiness for the trial of the prisoners who have been committed for alleged participation in the recent theft. The trial begins at Portsmouth Quarter Sessions on the 26th. On the way from Queensferry to the Channel at the end of May the Home Fleet carried out an eight hours' full-power trial. The cruiser *Invincible* was the first to reach Spithead, her fastest run having been close on 28 knots, and she did 27 knots for five or six hours. This is a record performance for a vessel of her size. The work of salving the destroyer *Blackwater*,

which was sunk off Dungeness, has been abandoned after £4,227 had been spent on the work, but the guns, mountings torpedo tubes, etc., were saved. The ship's original cost was £75,040, exclusive of her guns. Over a hundred mechanics have been discharged, including sixty boilermakers and fifty men from the factory under the manager of the engineering department. The reason given is the necessity for a re-adjustment of trades. There is, however, likely to be a re-entry of men in the Constructive Manager's Department shortly. The old Battleships *Barfleur* and *Centurion* have been paid off in readiness to be taken to the Motherbank, where they will be moored until sold out of the service. They are sister ships of 10,500 tons, the former having been launched at Chatham and the latter at this yard, both in August, 1892. The cruiser *Hermione* has arrived from the Cape of Good Hope Station and will pay off after the manœuvres. A court martial has been held to inquire into the stranding of the vessel, which went ashore in February in the neighbourhood of Zanzibar. An explosion of petrol occurred on June 10th in submarine *A* 4, but happily without serious results. Lieutenant Harbottle, who was in command, was burned on the face and hands and was sent to Haslar Hospital, where he is doing well. Three seamen were also injured, but not severely. The lieutenant and his men were rescued by a petty officer from the parent ship *Mercury*. Commodore Shortland, who has been in command of the Naval Barracks since the beginning of last year, leaves on July 1st on account of having been promoted to flag rank. He will be succeeded by Commodore Cradock. It is interesting to note, as showing the rapidity of promotion of the captains, that eighteen months ago Rear-Admiral Shortland was thirtieth on the list. Another officer has left us, this being Engineer-Commander Graham, first assistant to Engineer Rear-Admiral Corner, the manager of the Engineering Department. He has been succeeded by Engineer-Commander James, who has been engaged on the *Collingwood* at Devonport.

Devonport Dockyard.

With the exception of the harbour ships and a few destroyers and torpedo boats all our vessels are engaged in the manœuvres and things are, therefore, pretty quiet. The order to mobilise the nucleus crew vessels of the Home Fleet was received at seven o'clock in the morning on June 17th and before nine every ship was properly manned, while by half-past ten the cruiser *Theseus*, the gunboats *Gossamer* and *Circe* and several torpedo boats were on their way to Berehaven. The mobilisation affected nearly 5,000 men, the largest number ever mustered at the port, yet everything went off without a hitch. Torpedo boat No. 13, the newest vessel of the coastal type, arrived from the builders during the day and was at once commissioned. She subsequently took her place in the flotilla and left for the scene of action. Good progress continues to be made with the outfit of the battleship *Collingwood*. The funnels, which have been under construction near No. 1 Jetty, alongside which the vessel is lying, are now completed and will shortly be placed in position on board. The after funnel is almost cylindrical and is over 40 ft. high and 17 ft. in diameter. It is one of the largest funnels yet constructed. The foremost funnel is oval in shape and is five feet less in diameter than the after funnel. The torpedo attack and defence of the vessel will be most formidable, the former consisting of the new 21-in. torpedo, which has 7,000 to 10,000 yards range, while the searchlights will ensure not less than ten lights being concentrated on any point, the full number of lights to be mounted being twenty. The interior work of the five 12-in. barbettes is well advanced and early shipment of the mountings is expected. The vessel will not, however, be ready for the pennant by February next, the time originally decided upon. Engineer-Commander James, who has been on the staff of the Admiral-Superintendent in connection with the Collingwood, has been succeeded by Engineer-Commander Willoughby, who has been for the past three years engineer-overseer of Admiralty work at Messrs. Thornycroft's. The construction of the armoured cruiser *Indefatigable* continues to make very satisfactory progress, and at the beginning of June, when she had been in hand thirteen weeks, the hull had been advanced to about one-third of the launching weight. The delivery of material continues steadily, and transport to the slip is greatly facilitated by the provision now made for berthing vessels alongside the new jetty adjacent. The rate of building works out at about 185 tons per week. After the battleship *Téméraire* was commissioned, as mentioned last month, Engineer Rear-Admiral Wishart, the manager of the Engineering Department, assembled the officials acting under the orders of the engineering manager and expressed his appreciation of the efficient supervision which had resulted in the completion of all the acceptance and endurance trials without hitch or accident, thus enabling the commissioning and departure dates to be kept. This was a well-deserved compliment. The refit of the cruiser *Theseus* was completed at the end of May and she resumed her duties as tender to the gunnery school. During her refit attention was specially given to the fire control armament and magazine fittings, in order that the training of classes under instruction may be as complete as possible. The battleship *Commonwealth* is to be taken in hand for a refit as soon as possible after July 26th, by which time the vessels will have returned from the manœuvres. She is to be completed in six weeks. A rare accident happened to the cruiser *Isis* during her recent cruise. Upon being docked on her return to port for examination of her under-water fittings it was discovered that a considerable part of the lower section of the rudder had disappeared. Advantage is, therefore, being taken of the presence of the vessel in dock to thoroughly examine her propellers and shafting. The *Itchen*, of the Second Destroyer Flotilla, came in at the end of May in tow of the depot ship *Aquarius*, and was placed in dock for repair. The destroyer, it appears, went on Skerry Rock while taking up a fresh anchorage in Scapa Bay during a heavy northerly gale. The examination of her under-water fittings shows that the blades of both propellers were either broken short off or crumpled up, and it will be necessary to replace them and also to remove the shafts, which will have to be tested for alignment. Special interest attached to the annual prize distribution on June 10th at the Royal Naval Engineering College, for although the institution will not actually cease to exist as a training establishment for engineer students for a year it was the last gathering of the kind which will take place there.

Chatham Dockyard.

All the large ships which were in hand refitting have left to join their respective divisions for the manœuvres, and the yard is now practically denuded of vessels, with the exception of the stationary vessels, the four ships which are being converted—the *Andromache*, *Apollo*, *St. George* and *Pomone*—the special service battleships, and some small craft. The cruiser *Cressy* left to rejoin the Third Division of the Home Fleet on June 5th, the battleship *Agamemnon* following two days later to rejoin the First Division. The *Black Prince*, of the Cruiser Squadron of the Atlantic Fleet, left on the 8th, the battleship *Dominion*, of the Second Division of the Home Fleet, following next day. On the 10th the battleship *Victorious* left, and on the 11th the battleship *Magnificent* and the cruiser *Antrim*, these three vessels all belonging to the Third Division of the Home Fleet. The special service battleships were mobilised for the manœuvres on June 17th. The flag of Rear-Admiral Jerram, who is employed on special service with the Admiral commanding the Third and Fourth Divisions of the Home Fleet, was hoisted in the battleship *Goliath*, he having been appointed to command the White Fleet during the manœuvres. Altogether at this port and at Sheerness five battleships, two armoured cruisers, four protected cruisers (one of these a mine layer), two scouts, two torpedo gunboats, nineteen destroyers and twenty torpedo gunboats had their crews completed to full numbers, so the two ports are denuded of men as well as ships. The destroyer *Porcupine*, of the Portsmouth flotilla, will be paid off on June 28th, when she will be taken in hand for a somewhat extensive refit. The town councils of Chatham, Gillingham and Rochester recently requested the Admiralty to receive a deputation to ask that facilities should be provided at this yard for building and repairing ships of the *Dreadnought* type. Their Lordships in their reply pointed out that the question was fully discussed last November, and they see no reason for the matter being again discussed. The town councils have, therefore, decided to rely upon the services of the local members of Parliament, who have been urged to press the claims of the yard whenever

opportunity presents itself. There the matter will probably end until My Lords take it into their heads to change their minds, for it is certainly useless for local authorities to dictate questions of policy to the powers that be. Petitions have been sent to the Admiralty for increases of pay, etc., in reply to which their Lordships have intimated that representatives will come to Chatham during the last week in June to receive deputations both from this yard and from Sheerness. It has now been officially announced that Rear-Admiral Ommanney is to succeed Vice-Admiral Giffard as Admiral-Superintendent. The appointment was forecasted in these columns in April. A change has taken place in the Engineering Department, Engineer-Commander Bone, first assistant to Engineer Rear-Admiral Rudd, the manager, having left. He has been succeeded by Engineer-Commander Baldwin, who has been serving in the *Terpsichore* at Portsmouth for the past two and a half years. The local branch of the Royal Naval Aritficer Engineers' and Engine-Room Artificers' Benevolent Society do useful work by arranging lectures on scientific subjects for the benefit of its members in order to keep them up-to-date with the improvements in marine engineering. The inaugural lecture was by Mr. W. P. Durtnall, M.I.M.E., who took as his subject "The electrical transmission of power for main marine propulsion." The lecturer gave a very interesting and instructive discourse, illustrated by lantern slides, these showing, among other things, the engines of the *Mauretania* compared with those of the *Dreadnought*.

Sheerness Dockyard.

The port is now deserted, almost every vessel having left to take part in the manœuvres, including the vessels with nucleus crews, which were mobilised on June 17th. The manœuvres are to be on a far larger scale than anything hitherto attempted. The fleets engaged are the Home, Atlantic and Mediterranean Fleets, numbering in all about 350 vessels, ranging from submarines to battleships. On return from the manœuvres about July 19th the Home and Atlantic Fleets will, as stated last month, anchor off Southend for a few days. On the 20th the Lord Mayor of London, at whose request the visit to the Thames is being made, will come down to see the ships and on the two following days the men and the officers are to go up to London, when they will be entertained by the City authorities. Some of the smaller craft, such as submarines and torpedo boats, will go higher up the river, probably as far as the Tower of London and Houses of Parliament at Westminster. An experimental test was carried out from June 7th to 10th with the boom across the Medway at the entrance to the harbour—from Garrison Point to the Martello Tower and from there to the Isle of Grain. The test was most successful in every way and was noteworthy from the fact that a squadron of battleships and cruisers passed through one of the sections. The old battleship *Rodney* also passed through to her last rest, being towed by tugs on her way to the north to be broken up. There is every reason to anticipate that a floating dock large enough to take a "Dreadnought" will, before very long, be stationed here, as in reply to a question on the subject the First Lord recently stated that the matter was under consideration. The advantage of having such a dock is apparent and needs no arguments in its favour. The torpedo gunboat *Dryad* has come in for a big refit, which is to include the fitting of water-tube boilers. Alterations are also to be carried out to better adapt her for her duties as navigation school ship, she having been engaged in that capacity for some time past at Portsmouth. The *Dryad*, upon which £17,050 is to be expended, is one of five torpedo gunboats built fifteen years ago with poops as well as forecastles. She has served two commissions in the Mediterranean and has also been employed in home waters under the Admiral commanding the Coastguard and Reserves, so she has not been idle much of her time. The torpedo gunboats *Jason* and *Speedy* have completed their refits and resumed duty with the Nore Destroyer Flotilla. The depot ship *Tyno* has become the depot ship of the flotilla in succession to the *Blake*, and the cruiser *Diamond* has become the parent vessel. A report is to be made as to the most suitable place in the Medway to berth the destroyers of the flotilla, as in future they are to be moored in the river instead of in the steam basin at Chatham when not cruising. We had a visit on June 15th from Captain Koerber, the Russian Naval Attaché, who was conducted over the establishment. The foreman of the engineering branch, Mr. E. Lakey, has been appointed acting-examiner of dockyard work, in place of Mr. T. Elvy, who has been appointed engineer assistant to the Director of Dockyards.

Pembroke Dockyard.

The cruiser *Boadicea*, which has been built and equipped at a cost of £332,000, was commissioned by Commander Leake on June 10th and proceeded to Devonport on the following day to complete with stores. The vessel is to replace the cruiser *Topaze* as commodore's ship in the First Destroyer Flotilla. The *Boadicea* steams two knots faster than the "Diamond" class, to which the *Topaze* belongs. As to the cruiser *Bellona*, her steel conning tower, which was forged in one piece and weighs about 12½ tons, has been lifted in and the four funnels have been shipped. The erection of two funnels entitled the Fairfield Shipbuilding Company to an instalment in part payment for their work, and the erection of the other two to a still further instalment. The unarmoured cruiser in course of construction, hitherto known as "No. 1," is to be named the *Blanche*, and "No. 2," which is to follow her on the slip, is to be the *Blaonde*. The *Blanche*, now that the *Boadicea* has been completed, is making more rapid progress, it having been found possible to make an addition of between sixty and seventy to the mechanical staff employed on the ship. Engineer-Lieutenant Hobbs, who had been at Portsmouth for two months as second assistant to the manager of the Engineering Department, came here at the beginning of June as engineer assistant to Mr. Pledge, the chief constructor. Lieutenant Hobbs, who was appointed assistant engineer eleven years ago, passed a special course at the Royal School of Naval Architecture and the Royal Naval College, Greenwich, and was for some time instructor of applied mechanics at the latter institution. This appointment, coupled with the fact that after the refit of the destroyer *Violet* is completed the *Sylvia* and *Osprey* are to be sent here for refit, point, it is stated, to an eventual reduction in the local shipbuilding programme. The refit of the *Violet*, which includes the retubing of her boilers, should, as originally arranged, be completed by the end of June, but she will not be ready by that time. The delay is due to some extent to difficulties which are being experienced with the boiler tubes. The new tug *Rambler*, which has been built for the Admiralty by Messrs. John Brown & Co., Glasgow, called here on her way to Dover, where she is to be stationed. She took in tow one of the fourteen large floating stages, or "camels," as they are called, which have been built here for service in Dover Harbour.

DOUBLE-ENDED FERRY STEAMER.—An interesting contract has been placed with Messrs. Cammell Laird & Co., Ltd., for a double-ended ferry steamer of a special type, having a length of 140 ft. and a breadth of 55 ft., for the Havana Central Railroad Co. The vessel is somewhat of the American type, with three decks, propellers at each end, water-tube boilers, etc., etc., all to the designs and specifications of Messrs. James Pollock, Sons & Co., Ltd., London, under whose supervision this vessel will be built.

WHITE STAR DOMINION SERVICE. DEPARTURE OF THE "MEGANTIC."—The twin-screw steamer *Megantic*, built by Messrs. Harland & Wolff, Ltd., Belfast, for the White Star Dominion Line, left Belfast Lough on Friday, the 4th June, and proceeded to Liverpool. The *Megantic*, as is already well known, is a sister ship of the *Laurentic*, but has twin screws, whereas the *Laurentic* has the combination of reciprocating engines and turbine. The *Megantic* is 565 ft. long and about 15,000 tons. The new vessel is designed to carry a large quantity of cargo, and also a full complement of passengers—about 260 first-class, 430 second-class and over 1,000 third-class. The passenger accommodation has been carefully arranged, and is in every way up to the White Star standard. The entrances and public rooms, as well as the state-rooms, will be admired, not only for their artistic decoration, but also for their height and roominess. In addition to the general comfort ensured by the luxurious appointments and spacious character of the rooms and promenades, every other possible provision has been made, and many popular devices adopted to enhance the comfort and pleasure of the passengers. The *Megantic* sailed for her first voyage on the 17th of June.

THE DINNER OF THE WORSHIPFUL COMPANY OF SHIPWRIGHTS.

Held in the FISHMONGERS' HALL, on *Wednesday, June 9th*

Lord Pirrie, the master, presided at the dinner of the Shipwrights' Company on June 9th, when a representative gathering assembled to do justice to the feast provided and to show appreciation of the good work being done by the members of this ancient guild, to welcome the new master and to manifest to the principal guests of the evening, the undoubted influence of the craft on the trade of the empire. By the kind permission and courtesy of the Fishmongers' Company, the occasion was celebrated in the handsome Fishmongers' Hall.

Sir Edward Clarke proposed with considerable verve the toast of the Lord Mayor and the Corporation, commenting upon the ever-increasing duties devolving on the Lord Mayor and Sheriffs in connection with the receptions accorded to representative bodies, he praised the hospitality which was a feature of the Corporation of the City, and a powerful means of showing good-will and friendship, maintaining amicable relationship with good fellowship towards visitors from all nations. The representatives of the Press gathered together from different parts of the empire had that day an experience of the courtesy extended by the Lord Mayor, and had partaken of the far-famed hospitality of the civic authorities. The Lord Mayor, in responding, expressed the view taken by the Corporation in respect to the naval review to be witnessed at the mouth of the Thames, to the effect that it would be interesting, popular and of great value for many reasons, and the action of the Admiralty in making the arrangements was highly appreciated.

Rt. Hon. Lord Pirrie, K.P.

TABL

Rt. Hon. L

Table A (top row):

Sir John Wolfe Barry, K.C.B.
Mr. Alderman and Sheriff Hanson
Sir Alfred J. Newton, Bart.
[illegible] Ritchie, Bart.
E. H. Holden, Esq., M.P.
Sir William T. Lewis, Bart.
Rt. Hon. Sir Charles B. McLaren, Bart., M.P.
Rt. Hon. Sir Joseph C. Dimsdale, Bart.
The Hon. Charles A. Parsons
Sir Hudson E. Kearley, Bart., M.P., *Chairman Port of London Authority.*
Rt. Hon. Lord Gorell
Rt. Hon. Lord Allerton.
Rt. Hon. Lord O'Hagan
Most Hon. The Marquis of Graham, C.V.O.
Rt. Hon. Sir George Wyatt Truscott, *Lord Mayor*

A

H. Graham Harris, Esq., *First Warden.*
Prof. J. H. Biles, Esq., LL.D., F.R.S.E., *Second Warden.*
[illegible] Callender, Esq.
[illegible] Wood, Esq.
J. H. Hallet, Esq.
J. W. [illegible], Esq.
[illegible] Mason, Esq.
G. H. Musgrave, Esq.
[illegible], Esq.
J. J. West, Esq.
[illegible] Hammond, Esq.
[illegible], Esq., J.P.
A. J. Fells, Esq.
Robert Fells, Esq.
I. F. [illegible]

B

R. W. May, Esq.
[illegible]
G. Kelson, Esq.
R. H. Marks, Esq.
H. [illegible] Amos, Esq.
L. Bamberger, Esq., [illegible]
[illegible]
[illegible], Esq.
John [illegible], Esq.
J. Hertz, Esq.
F. E. Fells, Esq.
S. W. Fells, Esq.
John Fells, Esq.

Mr. Under-Sheriff A. D. Hassell
J. H. Tudsbery, Esq., D.Sc.
A. Burdick, Esq.
W. Pritchard-Morgan, Esq.
J. W. Cook, Esq.
F. A. Holman, Esq.
James Forbes, Esq.
Jas. U. Parkes, Esq.
E. Towse, Esq.
G. G. W. Willcocks, Esq.
F. F. Grimes, Esq.
A. Wood, Esq.
H. M. Philp, Esq.

Acting Secretary Educational Trust Fund.

C

Engineer Vice-Admiral H. J. Oram
Sir J. Fortescue Flannery, Bart.
Owen Philipps, Esq., M.P., *Deputy Chairman Port of London Authority.*
Sir James L. Mackay, G.C.M.G.
Sir Geo. Hingley, Bart.
Sir Marcus Samuel, Bart.
Sir Joseph Savory, Bart.

H. T. Bailey, Esq., *Past Master.*

Prof. J. J. Welch, Esq., M.Sc.
T. P. Coubro, Esq.
W. C. Downing, Esq.
Walter Low, Esq.
James Marr, Esq.
H. S. Foster, Esq., D.L., ex *Sheriff.*
C. E. Davies, Esq.
J. E. Munro, Esq.
J. G. Fisher, Esq.
B. F. Fisher, Esq.
A. C. Beal, Esq.

Sir Alfred L. Jones, K.C.M.G.
H. W. Drummond, Esq.
C. F. Moberly Bell, Esq.
Cortauld Thomson, Esq.
Henry Holloway, Esq.
Times.
Daily Telegraph.
Daily Mail.
London News Agency.

The Rev. Canon E. J. Beck, M.A., *Chaplain.*

D

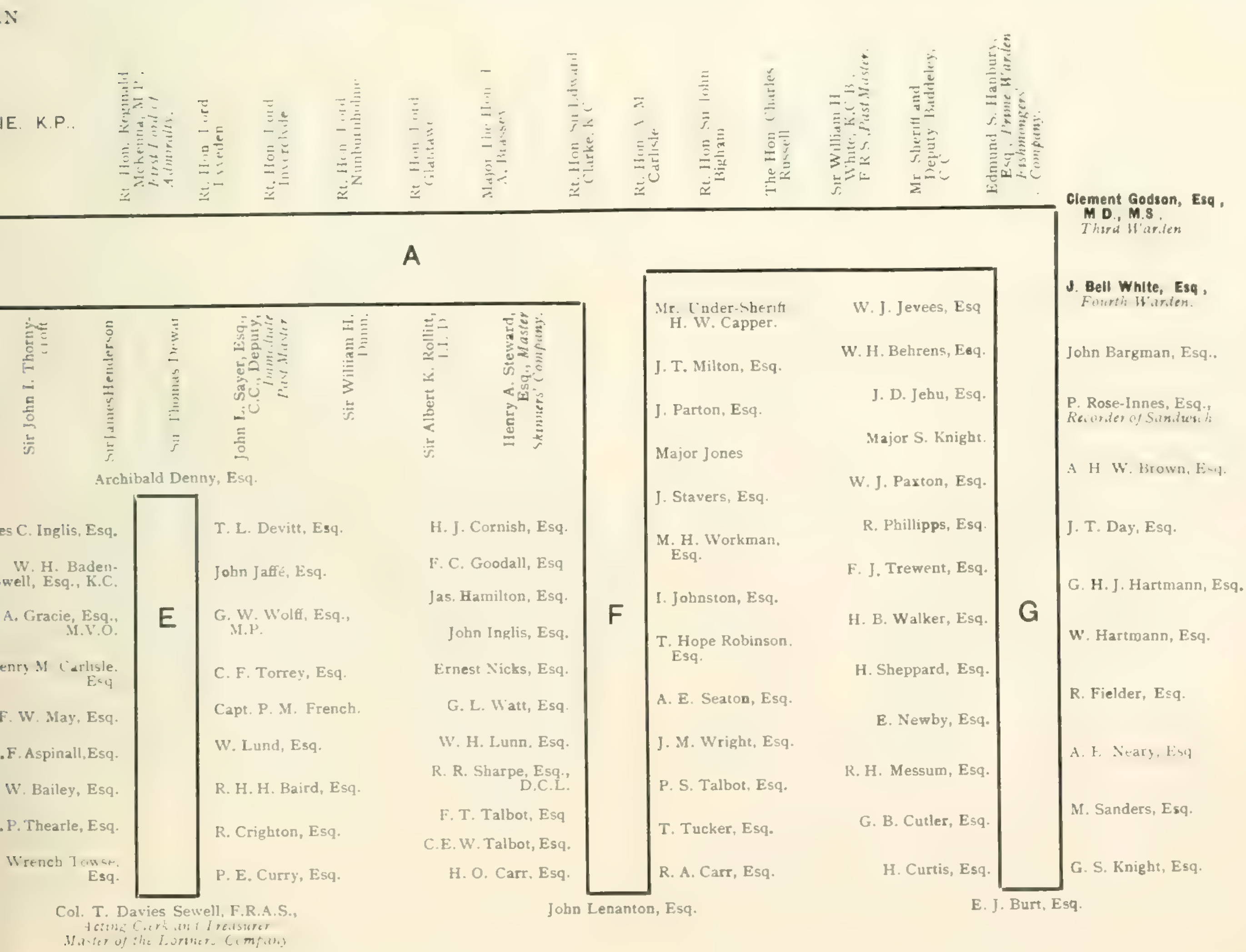
Capt. Sir Theodore Angier.
H. W. Lucy, Esq.
G. Harland Peck, Esq.
Capt. R. Slazenger, C.C.
Morning Post.
Daily Chronicle.
City Press.
Press Association.
Syren and Shipping

"Ships, Colonies and Commerce" was proposed by Sir Wm. H. White (Past Master), who, in upholding the toast as worthy of the highest acceptance, pointed out the vast influence and interests which ocean traffic held in connection with social and international life. The power of that influence was no less now than it was in the days when Raleigh magnified the craft of the sailor, and in doing so, magnified that of the shipwright who made possible the work of the ocean trafficker. The words of Raleigh, "The sea commands the trade," still held good, and signs were not wanting that the saying was being more realized. The empire could only be held together by maintaining its influence upon the sea, and its maintenance was vital to the interests of the nation, the colonies and the commerce of the country. Mr. McKenna (First Lord of the Admiralty), in responding, admitted that the command of the sea was necessary for trade and commerce, and in order to preserve it for this purpose a great duty lay upon Britain to maintain her supremacy and keep the ocean free for the peaceful work of all nations, carrying produce to and fro. This was the essential privilege of Britain in virtue of the insular position she occupied and the widespread character of the interests to be maintained not so much by land as by sea. Those interests were not of an aggressive nature, but otherwise, inasmuch as the nation that was the greatest trader of the world was keenly alive to the requirements of that trade and only desirous of keeping the ocean free that merchantmen might cross and recross without hindrance in pursuit of their vocation; only thus could the people be supplied with the necessaries of life. The Navy was an instrument of peace, and as such it was fittingly kept up to a standard which was necessary to give a sense of security on the sea, as the civil authority does on land. Mr. E. H. Holden, in further response, endorsed the position, by adding statistics to show the volume of trade attaching to Britain, both as an exporter and importer. The financial value of the trade was very great, greater than that of any nation, and while commerce depended on the sea for its carriage, finance was quite as necessary and was followed by trade as its outcome, the removal of finance would be followed by the removal of trade.

Lord Allerton proposed the guests, and eulogised the quiet work being done by the Shipwrights' Company through its members; its influence was extensive and the educational advantages to the community were extensive.

Lord Gorell, in responding, thanked the hosts for the hospitality extended to their visitors. Mr. E. Hanbury (Prime Warden of the Fishmongers' Company) followed, expressing his pleasure at the opportunity of meeting the Shipwrights' Company on such an occasion.

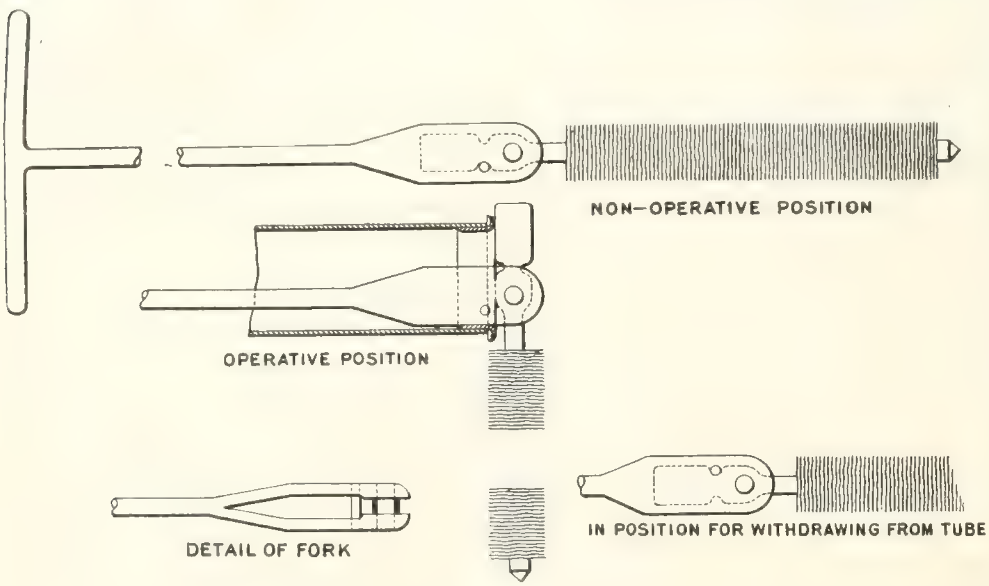
The toast of the Company was then proposed by Sir John Bingham, who referred to the ancient charter of the shipwrights and the important nature of the craft in helping to dominate the position of Britain on the high seas. The Master, Lord Pirrie, replied in his usual eloquent way. Although the Shipwrights' Company was not a wealthy one, it possessed a power and influence which were difficult to be exaggerated. The position of the empire was largely dependent upon the craft and its members. He was proud to fill the position which had been accorded to him as Master of the Company in succession to so many eminent men, whose services had been so great to the Company and the nation. With characteristic warmth he responded to the good wishes expressed, and as the representative host of the evening he was genial and hearty to all, members and guests.



"QUIXO" BOILER TUBE-END AND PLATE CLEANER.

WHEN a multitubular boiler has been some time in use it is found that considerable difficulty is experienced in maintaining the full pressure of steam, due to the back ends of the boiler tubes and the tube plates, in which they are supported, having become encrusted with soot and other deposit, thereby preventing perfect combustion and the proper utilization of the heated gases.

As the ends of the tubes and the tube plates are within the combustion chamber, and are subjected to intense heat, it is obviously impracticable for men to enter the combustion chamber in order to remove the deposit while the fires are going and steam is on the boiler.



The removal of the soot and other deposit can now be simply and easily effected by a device invented by Captain F. S. Pett, of Dover, which is illustrated in the adjoining diagram.

It will be observed that the device consists of a half-inch rod, a foot longer than the tubes to be cleaned, one end of which is provided with a T-shaped handle and the other end with a fork, between which is pivoted a hard-wire brush of special construction and of about ten inches in length.

When the device is being passed through the boiler tube this brush is disposed end on to the rod, and when used in cleaning the tube ends and tube plates in the combustion chamber it is allowed to assume a position at right angles to the rod.

In order to effect these relative positions, the fork between which the brush is pivoted is provided with a pin adapted to engage into a recess formed on an extension of the brush shank.

The cleaning process is carried out as follows:—A retarder is permanently removed from the centre tube of the group to be cleaned, and the brush end is passed through this tube in the non-operative position.

When the brush reaches the combustion chamber he T-handle in the stoke-hole is given a half-turn, which allows the brush to drop about its pivot into the cleaning position, so that by imparting a rotary and pulling motion to the handle of the cleaner the brush sweeps at one operation some forty to fifty tube ends and the surface of the tube plates supporting such tubes.

To remove the brush from the combustion chamber it is first pushed away from the tube plate and is then given a half-turn, so that it falls by its own weight into and is held in a horizontally extended position by the pin, so that it can be drawn into the tube with great facility.

It is found in practice that if the tube ends and the tube plates are cleaned at the commencement of the voyage, and the brush is used twice a week during the time the boiler is under steam, the tube ends and tube plates will be maintained quite free from deposit. It is found that in practice only two per cent. of the retarders have to be removed in order to thoroughly carry out the cleaning operations at the back tube ends.

It is claimed by the inventor that by cleaning the tubes and tube plates in this way something about 11 per cent. can be saved in the coal consumption, which appears to be substantiated by the report of Mr. McCliment, Chief Engineer of the South-Eastern and Chatham Railway Company's s.s. *Invicta*, who has used the rod and brush during the last commission of this ship, and states that he found it most useful and that it did its work well.

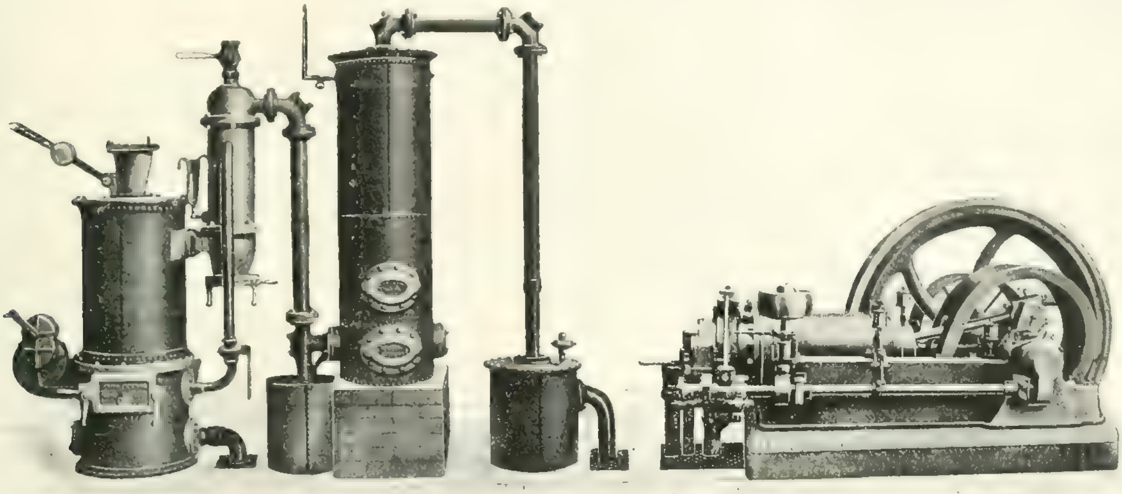
The tube ends in the combustion chamber were found to be absolutely free from "bird-nesting" after running eight weeks, while the boilers steam as easily at the end of the commission as at the commencement. He used the brush twice a week, and the time occupied in cleaning each box was about four minutes. The saving effect on fuel, comparing the consumption with that of the corresponding commission last year, worked out at 11·6 per cent.; and he expressed the opinion that, apart from this saving, it is a great benefit to be able to maintain steam easily throughout a commission without in any way forcing the boilers.

We understand that the P. and O. Steam Navigation Company, the Orient Steam Navigation Company and other shipping concerns have placed orders for these tools and that, after prolonged trials, they have also been adopted by the South-Eastern and Chatham Railway Co. for use throughout their entire fleet.

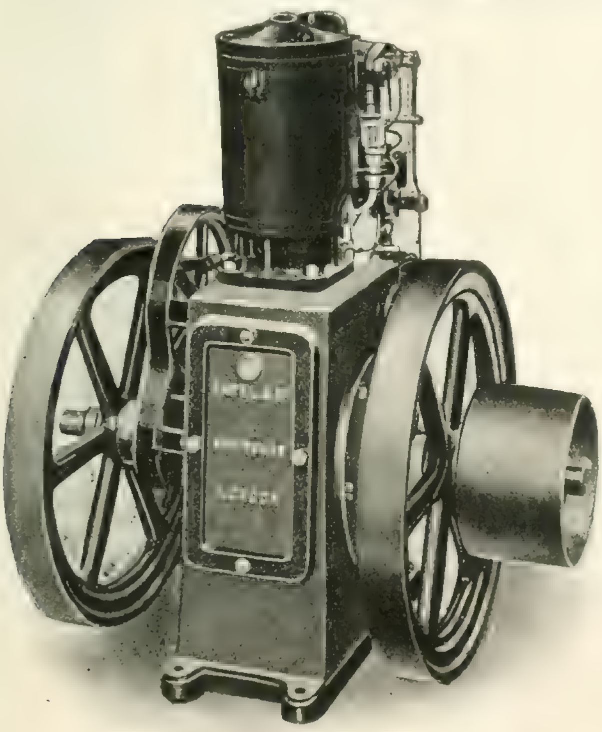
Scott's Shipbuilding and Engineering Company, Greenock, have received an intimation from the Admiralty that the "Dreadnought" to be built and engined by them will be named *Colossus*.

THE INTERNAL COMBUSTION ENGINE.

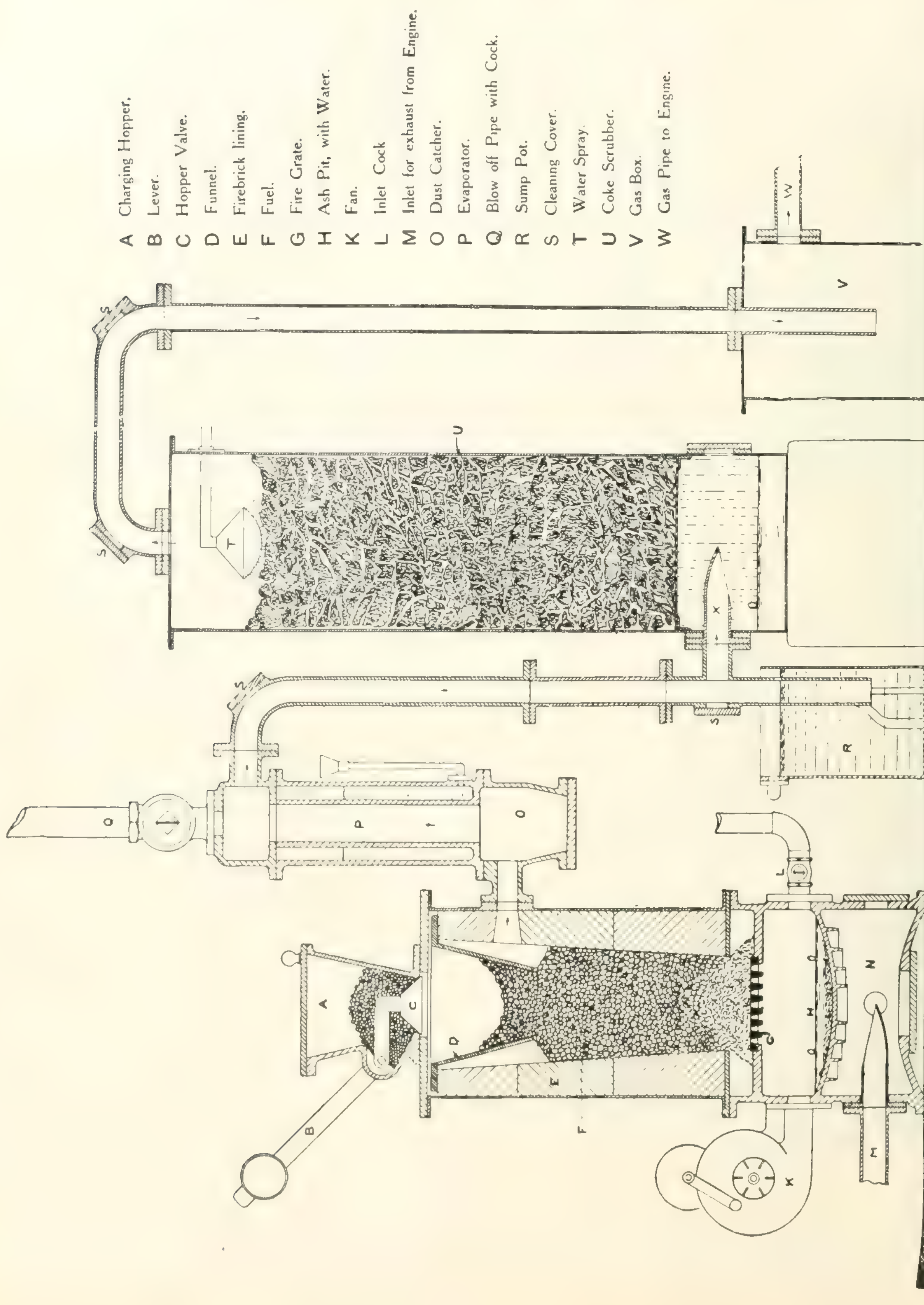
THE manufacture and fitting of the details of the internal combustion engine are full of interest to the marine engineer, as he is not yet so fully acquainted with the mechanism as he will probably require to be in the days to come, if we may gauge the future by the number of papers and discussions which have, during the past few months especially, engaged the attention of various technical societies, and wherein the economy and convenience of this class of engine have been set forth in glowing terms by its advocates. Its suitability for marine work, both in regard to ship propulsion and to auxiliary machinery has been shown, by means of argument and comparison of results, to be superior to the steam engine, more especially for the auxiliary machinery, in view of the heavy fuel consumption of the ordinary steam winch. Engines for land and small marine work have been successfully made, reliable and economical, by several firms, and we recently had an opportunity of seeing the details and workmanship executed by Messrs. Capel & Co., at their works in the north of London. The machinery in the works is driven by means of an internal combustion engine requiring an amount of



Combined Engine and Plant



fuel for the week's run which seems incredibly small to those accustomed to the service of the steam engine and boiler to do the same amount of work. The details of the engines in course of construction, as well as those completed and ready for delivery, one of which we witnessed under test, show that good care and attention is bestowed upon them in the design and finish. By the courtesy of the firm we are enabled to show illustrations of the combined engine and plant, vertical engine, also the gas-producing plant in section from the hopper to the gas outlet branch to which the engine pipe is connected. The generator consists of a malleable iron cylinder lined with fire brick backed with a layer of foundry sand. The fire grate is so arranged that it can readily be cleaned while the plant is at work, and the hopper is fitted with a valve, so that in charging the furnace the gas being generated is kept from escaping, while a sight-hole admits of examining the state of the fire while in action. Under the generator is a cast-iron receiver into which the exhaust from the engine enters, and is distributed over radiating vanes on the underside of the ashpit, in which water is kept at a certain level, automatically. The exhaust and the radiated heat from the grate thus produce the steam necessary for the gas. The vaporiser through which the gas passes is of cast iron ; the air required for the gas is taken into an outside jacket in which water is kept automatically at the required level. The air becomes saturated with water vapour and the gas passing inside the receiver is cooled by the water on the outside. Any dust sucked over from the plant is caught at this stage in a receptacle fitted with a cleaning door. The scrubber and sump box are also as conveniently fitted. The steaming arrangement is a special feature of this plant, giving an automatically regulated supply of steam according to the work required. The gas reservoir is fitted with an internal pipe carried well down below the outlet pipe to the engine, so that any moisture in the gas falls to the bottom, and does not reach the engine. Test and drain cocks are fitted on the reservoir. A fan is fitted to act below the furnace grate, so that the combustion may be set away and kept up under forced draught by hand or power as required. The generating plant is thus simple and complete ; it is well illustrated in the section shown. The designs of the engines combine the advantages and improvements of the latest gas engine practice, British and Continental. By a series of tests a most efficient working engine has been evolved, and with such attention to design and simplicity of



Capel's Suction Gas Plant in Section.

construction that every detail can be readily and speedily disconnected, cleaned, overhauled and replaced. The details or the engine throughout appear to be of the best-class material and finish. The governor gear is well suited to the purpose of ensuring economy in working, regulating the fuel consumption to the work being done by the engine. The lubricating arrangements are specially adapted for the several purposes from the cylinder and piston to the valve gear.

DREDGERS AND DREDGING PLANT AT THE IMPERIAL INTERNATIONAL EXHIBITION.

As indicated in the brief description of the exhibits in the Machinery Hall of the Imperial International Exhibition at Shepherd's Bush, given in our last issue, a considerable number of models, photographs and other items, illustrative of ocean and channel steamers are shown by shipbuilding firms from several districts of the kingdom, as well as by the railway companies and others owning channel and other passenger steamers. No class of shipbuilding productions is so strikingly to the front as that of dredgers, hopper barges, and other like craft, and Clyde shipbuilders, renowned for their specialities in this direction, are well represented. The well-known and old-established firm of Messrs. Wm. Simons & Co., Ltd., of Renfrew, occupies a prominent stand at the main entrance to the Machinery Hall, and on a similarly arranged stand directly opposite Messrs. Ferguson Brothers, of Port Glasgow, command equal attention. We endeavoured in the brief account given last month to make adequate reference to the Port Glasgow firm's work as represented at the stand, but through some unfortunate circumstance the exhibits of the Renfrew builders were not properly in evidence until some days after the official opening, when our commissioner's first visit was paid and his notes prepared. As now arranged, the stand of Messrs. Simons & Co. consists of a most imposing grouping of models and photographs of the various types of dredging vessels and elevating deck steamers, in the construction of which they are acknowledged specialists, and for which they have obtained a deservedly world-wide reputation. In addition to the best-known types of bucket-ladder and pump dredgers for port and harbour improvements there is included a model of the clay-cutting suction and discharging reclamation dredgers *Jinga* and *Kalu*. These dredgers, constructed last year to the order of the Bombay Port Trustees were set to work about the beginning of the current year at Bombay, dredging in stiff blue clay, and have already accomplished an enormous quantity of work. The firm are also exhibiting models of the "Simons" patent stern-well bucket and pump hopper dredger *Karnafuli*, constructed for the Chittagong Port Trust; of the *Percy Sanderson* of similar type, constructed for the European Commission of the Danube; of the barge-loading bucket dredger *Lyster*, constructed for the Mersey Docks and Harbour Board; of the suction hopper dredger *Grampus*, built for the Government of Natal; of an alluvial bucket ladder dredger and of a cross-channel elevating-deck train-ferry steamer. Three of these dredgers, the *Karnafuli*, the *Percy Sanderson* and the *Grampus* are on the hopper principle, of which Messrs. Simons are the inventors and first constructors, while the two first-named are of the stern-well type, another invention of these builders.

The dredging class of shipbuilding production is characterized by almost as great a variety of type, and of specialized modification, as any other general class of shipping. The nature of the material to be dealt with, the character of the working site, and the conditions under which operations must be carried on, are a few of the questions to be considered, and which regulate the type most suitable and the modifications and accessories necessary. Hence the remarks offered throughout this notice as to the reasons for the variations to be observed in the dredgers and dredging plant here shown. The claims made for the "Hopper" dredger are chiefly—economy in first and working costs as compared with ordinary dredgers and attendant barges, and the less space occupied than with the latter—a matter of grave consideration in a busy waterway. The advantages of the stern-well over bow-well dredgers are increased speed, improved steering qualities, and a form of hull better adapted for encountering rough weather, and offering more shelter when dredging in exposed places. The first stern-well dredger was the *Otter*, constructed for the Natal Government. In all, Messrs. Simons have constructed close upon 200 dredgers, ranging in hopper capacity from 150 to 3,000 tons, having a bucket capacity to raise from 100 to 2,000 tons per hour.

The model of the bow-well barge-loading bucket dredger *Lyster* conveys a vivid impression of the massive strength of this Mersey dredger. The bucket chain consists of thirty-nine buckets each of 20 cubic feet capacity of great strength and capable of dredging sandstone rock. Each bucket with pins weighs two tons, and each connecting link five cwts. The bucket chain is run at a speed of fifteen buckets per minute when dredging hard clay, while on harder material a speed of ten buckets per minute is maintained. The bucket ladder is arranged for dredging to a depth of 45 feet, and can be raised so as to open up a channel for the dredger itself. The dredgings are discharged in such a manner that two barges can be loaded from the dredger at the same time.

As an example of the large number of sand suction dredgers constructed by them, Messrs. Simons exhibit a model of the 1,400 ton twin-screw suction hopper dredger *Grampus*, the latest of a succession of almost exactly similar suction dredgers which they have constructed to the order of the Natal Government for the removal of the sand bar at the entrance to the port of Durban, Natal. The *Grampus* was built in 1902 and was followed in 1903 by the 2,500-ton pump hopper dredger *Nautilus*, which in turn was followed, two years later, by the pump dredger *Cetus*, with a hopper capacity for 3,000 tons. The sand-dredging installation is alike in all five dredgers, and consists of two centrifugal sand pumps, each driven by one set of triple-expansion surface-condensing engines. By the operations of these and other dredging vessels constructed by the same builders the port of Durban has been opened up to receive vessels of the deepest draught. A few years ago matters were far otherwise at Durban, the entrance to the port being blocked to all but vessels of the shallowest draught.

While the employment of bucket dredgers for the recovery of alluvials—tin and gold—is of comparatively recent date, the evolution of suitable plant to meet the varying needs of the material to be dredged and for the recovery of the deposit has been fairly rapid. For some years past much time and study have been devoted by those interested, to the designing of dredgers which could be profitably employed in gold and tin-dredging industry. Messrs. Simons are exhibiting a model of one of the largest and most powerful dredgers yet built for working the alluvial deposit. This dredger was constructed last year to the order of the Tongkah Harbour Tin Dredging Co., and embodies all the most modern improvements. The dredger's buckets are each $7\frac{1}{2}$ cubic feet capacity and the ladder is arranged for dredging to a depth of 40 feet under water level. Tailings are attached 50 feet astern at the height of 20 feet.

Highly interesting items in Messrs. Simons' collection are the model of the cross-channel elevating-deck train-ferry steamer already alluded to and two photographs of the first steam vehicular ferry specially designed for, and fitted with, Simons patent elevating deck. The *Finnieston* (the first to be so named) to be fitted with this ingenious and most important feature, was designed and built by the firm to the order of the Clyde Trustees for the cross river vehicular traffic at Finnieston, one of the busiest parts of Glasgow harbour. The great success of this vessel led to others being adopted by the Clyde Trustees, and at the present time this type of vessel plays no unimportant part in helping to a solution of the pressing problem of cross-river communication. The photographs of the *Finnieston* show the elevating platform in its raised and lowered condition, to suit the state of the tide at the time the photos were taken. The range of the elevating platform in these vessels is in relation to the range of the time where they serve. The train ferry, for example, is designed to permit a train of railway carriages (either passenger or goods) to be run on board, or to leave the vessel at quay level irrespective of the condition of the tide. Were a vessel of this type employed, say, on the Dover to Calais route, passengers

entering the train at London need not leave their seats in the railway carriages until arrival at Paris.

Steam hopper barges, which are still increasingly in use where dredgers are not of the "hopper" order, and where the spoil has to be borne out to sea, are as a matter of course represented at Messrs. Simons & Co.'s stand. It is perhaps not generally known that this firm were the first builders of steam hopper barges. A model is shown of the 1,200-ton steam hopper barges Nos. 21 and 22, two of the largest vessels of this class belonging to the marine floating plant of the Trustees of the Clyde Navigation.

JUNIOR ENGINEERS.

SINCE the new departure in tool steel manufacture, initiated by the Taylor-White process, the application of high-speed steel has become universally recognised as a prime necessity to all machines operating under heavy and moderate loads, as well as to a large number of the operations on automatic and turret lathes, and to a variety of other purposes where a relative saving can be effected due to higher speeds, more durable edges or increased stress. The number of brands on the market is now large, each in a measure distinguished by some slight difference in treatment, but more or less modelled upon the American process.

The percentage composition of ordinary tool steel approximates, with iron, to ·8 to 1·5 carbon, ·05 to ·3 manganese, ·16 to ·3 silicon, with traces of phosphorus, sulphur, copper, nickel, etc., and for machine tools the carbon is present to about 1·2 per cent. The principal difference in composition of the new steel is the addition of up to 3 per cent. of chromium and 6 per cent. of tungsten, and the heat treatment is radically altered. With ordinary tool steel the nose is forged at about 1,200°F., then re-heated to this temperature for hardening, and the temper drawn by suddenly cooling and allowing it to warm again to between 400 and 500°F., depending on the work required from the tool. In the case of high speed steel the tool is forged at a bright red to lemon yellow heat, depending on the brand, and the nose then heated right up to fusion point, within the limit of not spoiling the shape, and then allowed to cool gradually or in an air blast, hence the name air hardening, there being no tempering required in the ordinary course.

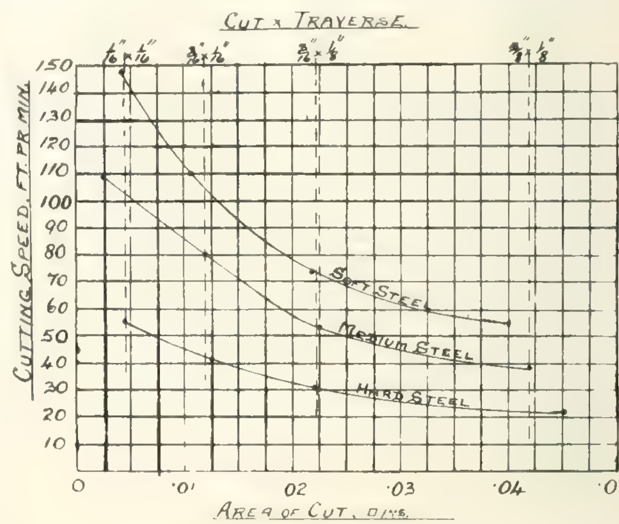
As the chief virtue of the steel is its ability to retain its edge at the temperature produced in taking heavy roughing cuts, there are some operations where the saving to be effected is less obvious; finishing cuts are usually but a small proportion of the total time, and the stress on the tool is not so severe, hence the grinding of the tool is not so relatively important, and the idle period is large enough to allow of this without loss of time, so that the unemployment of what is larger capital gives a disadvantage to the higher-priced steel, this, of course, not applying so much to machines where the tools are in continual operation, or where one tool does both roughing and finishing. For light cutting of brass and small articles, intricate or fragile, the heavy stress cannot be imposed; also for such work where special shapes of tool are required only occasionally, the idle time may annul the working time. For heavy roughing work, however, the tooling capacity of steel and the retentive edge both show to advantage, and more recently this latter quality has received attention and a further development is anticipated.

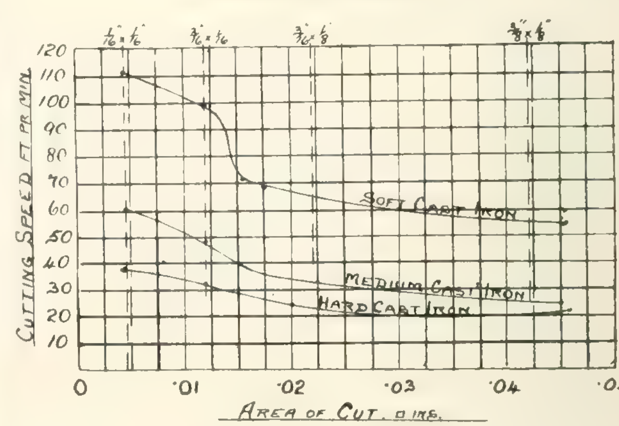
Of the machines already dealt with, the shaper and slotter are not so well adapted for higher speeds, the rate of cutting of these tools is more limited by their constructional features, the short travel of the cutting stroke is attended with the necessity of continually starting and stopping the tool, so that the inertia effect of the parts becomes more pronounced with higher rates of acceleration, and thus the advantage to be derived lies more with the ability of the tool to take heavier cuts and retain its edge longer at corresponding speeds, provided the machine is sufficiently rigid and the driving power available.

The planer has also the disadvantage of the accelerated and retarded periods, but these are a considerably less proportion of the whole time, and the stresses are more easily absorbed by the mechanism of the machine, particularly where special allowances are made for this, as in the Bateman planer, in which the rack is secured by springs to the table which takes up the jar at reversal, thus minimising shock and damage to the gearing, while the increased idle energy of the back stroke is stored in flywheels on the side of the machine to be given out on the forward working stroke. With extremely large parts, such as turbine cylinders, a high speed of table means a large waste in power in simply moving the part, and this has introduced a type of machine specially adapted for high speed and large work, in which the table is stationary and the tool standards are actuated to slide. A method adopted with the ordinary moving table machine has been to pivot the tool box, so that at the end of each stroke the tool is revolved half a turn and thus put in position to cut at every stroke; the table is in this case operated by a screw motion with a reversible motor.

For boring and drilling operations the new steel is eminently suitable, except for the smallest sizes of drills in sensitive machines, where the work is generally too light to be affected by the change, and the drills are operated not so much for a maximum of speed as for accuracy with a minimum of breakage, no small item with minute sizes and a consequently enhanced loss with the more expensive steel.

The milling machine upon certain operations pays for speeding up, where sufficient rigidity is available, but as stability is of much importance the bed is necessarily massive and the arbor well supported. The cutters employed are both of the solid and inserted type, and even at moderate





speeds a gain is effected by the more lasting properties of the edges on heavy work, such as machining boiler plates.

The absolute adoption of the steel was, however, decided by its application to the lathe, and the greater part of the research work undertaken has been in relation to turning tools. The most conclusive and extensive investigations so far undertaken have probably been those conducted at Manchester by Prof. J. T. Nicolson, under the auspices of the Association of Engineers and the Technical College. The

main differences in operation of cutting tools may be, from these trials, approximated to as follows

Cutting soft steel at $\frac{1}{16}$ in. deep by $\frac{1}{16}$ in. traverse.

High-Speed Steel	90 ft. per min.	..	$3\frac{1}{2}$ lbs. per min.
Musket Ordinary Steel	45 ,, ,,	..	$1\frac{3}{4}$,, ,,
Carbon Tool Steel ..	$22\frac{1}{2}$,, ,,	..	$\frac{7}{8}$,, ..

Cutting medium cast iron at $\frac{3}{16}$ in. deep by $\frac{1}{16}$ in. traverse.

High-Speed Steel	36 ft. per min.	..	$1\frac{1}{4}$ lbs. per min.
Musket Ordinary Steel	25 ,, ,,	..	$\frac{5}{8}$,, ..
Carbon Tool Steel ..	$12\frac{1}{2}$	..	$\frac{5}{16}$ .. ..

These results were obtained from an endurance trial of the tools, in which the finishing state of the high-speed material showed better than the other two at the end of the run. The tool angles adopted for the comparison were—

	Soft Steel.		Medium Cast Iron.
Top Rake	23°	..	10·5°
Side Rake	15°	..	8°
Front Clearance ..	4°	..	6°
Side Clearance	4°	..	6°

The net results of trials to determine the capacity of the steel at various rates in consonance with general practice are embodied in the accompanying diagrams, these tests being made on the six grades of material indicated, and the following table is representative of the performances on all of these :—

Cut by Traverse	Ft. per min.	lbs. per min.	lbs. per H.P. hour.
$\frac{1}{16}$ in. by $\frac{1}{16}$ in.	149·2	1·72	19·1
$\frac{4}{16}$ in. by $\frac{1}{16}$ in.	111·0	4·137	—
$\frac{3}{16}$ in. by $\frac{1}{4}$ in.	74·0	5·28	—
$\frac{3}{8}$ in. by $\frac{1}{8}$ in.	50·7	7·5	25·3

It is thus seen how marked is the difference in tooling capacity by working with heavy cuts at moderate speeds, for against the saving in time the weight per power required is not a small increase, and in the case of cast iron the power required gives a greater gain. The lathe under test was comparatively light powered, this accounting for the relatively small cuts as compared with those which have been obtained on more massive machines.

New Dredger for Soudan Government.—Messrs. Wm. Simons & Co., Ltd., Renfrew, are at present executing an order, recently received from the Irrigation Department of the Soudan Government, for a specially designed dredging vessel. This dredger will be principally employed dredging the sudd—material of a fibrous nature—which is found in the White Nile. Owing to the very limited depths of water, which prevails at some of the places where dredging operatons are to be carried out, the dredger will be of very shallow draught, and will be propelled by a paddle wheel at stern.

Lighters for Pernambuco.—Two steel coaling lighters, Nos. 255 and 256, have left Chepstow for Cardiff, where they will be lifted on board a large steamer bound for the above port. The lighters were built by Messrs. Edward Finch and Co., Ltd., Bridge Works, Chepstow. Their dimensions are: Length, 65 ft., breadth 18 ft., depth moulded 6 ft. They were specially designed of heavy construction for working outside the Reef at Pernambuco.

Messrs. Leonard Chapman & Co., Munton Road, London, S.E., report :—Graphite as imported according to quality.

Ceylon LL c.i.f. London	£32	0	0 to	£53	0	0	per ton.
,, OL	17	0	0 to	47	10	0	,,
,, Chips	15	0	0 to	35	0	0	,,
,, dust	9	10	0 to	28	0	0	,,
Purified and milled—							
Ceylon 97% to 99% f.o.b. London	£70	0	0 to	£75	0	0	per ton
,, 90% to 91% ,,	42	0	0 to	45	0	0	,,
,, 85% to 86% ,,	40	0	0 to	42	0	0	,,
,, 70% to 71% ,,	28	0	0 to	30	0	0	,,
American large flake, f.o.b. London	£50	0	0 to	£54	0	0	,,
,, fine ,,	45	0	0 to	49	0	0	,,
Graphite Paint Paste ,,	42	0	0 to	45	0	0	,,
Graphite Paint ,,		4	9 to		5	0	per gall.
Graphite Joint Compound	45	0	0 to	47	0	0	per ton

ELECTRICITY ON BOARD SHIP.

XXII.*

By Sydney F. Walker, R.N., M.I.E.E., Assoc.M.I.C.E., etc.

Control and Protection of Wires for Incandescent Lamps.

Wires that are used for distributing electric currents to lamps, etc., are unfortunately subject to troubles, which sometimes have serious results. The wires, as explained, are laid side by side, that carrying the current to the lamp, and that bringing it back, on the two-wire system, or one outside the other in the concentric system, and it sometimes happens that the insulation of the wires perishes, or is damaged by accident, the wires themselves then coming into contact, and a dangerous current passing through them. The heating effect of any current varies directly with the square of the electrical pressure that is producing it. The heating effect in any wire delivering its current in the ordinary way is very small, because the pressure present in it is also small. The pressure is used up in driving the current through the lamp. If, however, the lamp is cut out, short circuited, as it is termed, by a connection between the lead and the return wires, the whole of the pressure of the service is available for driving current through the short-circuited wires. The heating effect then increases from, say, that produced by 1 or 2 volts up to that produced by, say, 100 volts, or a trifle less, and as the heat varies as the square of these numbers, the enormous increase will be appreciated. This is what has led to fires on shore which have caused buildings to be burnt down, and it is the common practice now to protect wires by means of fuses. The fuse is a piece of metal, wire, foil or some convenient form, which has a low melting point, and a comparatively high electrical resistance. Being very short, its high electrical resistance does not appreciably affect the current passing through it, but its low melting point and its high resistance cause it to melt if a current passes through it above a certain prearranged figure. In the early days of electric lighting fuses were fixed in all sorts of out-of-the-way places. Now the practice is to place a group of fuses in some convenient spot, where they can easily be got at, and to take wires either for individual lamps or groups of lamps from the distributing fuse board, as it is called, direct to the places where the light is required. If a short circuit occurs on a pair of wires, the fuse protecting those wires melts and the current is cut off from them. When the cables and wires are run on the single-wire system, described in one of the previous articles, in which the body of the ship forms the return conductor, all that has been said above applies to the insulation on the single wire becoming defective, and the conductor coming into contact with the ironwork in the neighbourhood. This is one of the objections to the single-wire system. It is only necessary for the insulation of one wire or cable to be broken down to produce a short circuit, where with the double-wire system two breakdowns are necessary. The single-wire system is protected in exactly the same manner as the double-wire, but there is only one set of fuses fixed upon one fuse board instead of two. Modern fuses are now arranged to be easily replaced, without danger to the man who replaces them. They are generally made with two contact pieces, fixed to the end of an insulating handle, the fuse wire or foil being stretched between the contact pieces. On the fuse board are numbers of pairs of contacts, and the fuse is put in its place by pushing its contact pieces between a pair of those on the board. The pairs of contact pieces on the fuse board are connected to the distribution service in such a manner that the fuse wires, or foils, are in the circuit to be protected, when the fuse is in place. It is usual with the double-wire system to have fuses on each of the two wires, the leads and returns. There are special forms of fuses employed on shore, designed to eliminate another trouble that arises when the fuse "blows," as it is termed. When a short circuit occurs, and the fuse melts, there is a considerable scattering of the molten metal, and there is also an arc formed for a very short interval, the result being that the fuse board is somewhat damaged by the heat of the arc, and the molten metal is driven outwards and makes

* For Articles I. to XXI., see previous issues.

a good deal of mess, sometimes causing damage. To obviate this, the fuse wire is sometimes enclosed in a tube, which by different inventors has been filled with water, an insulating oil, and with certain substances that extinguish the arc. The operation of the fuse in these cases is as follows. When the excessive current arrives the wire melts and parts, and in place of the molten metal scattering as above described, and of an arc being formed between the broken ends of the wire, the arc is promptly extinguished, and any scattering that takes place is confined to the tube itself. The writer is not aware of these fuses having been employed on board ship. They have not been very largely taken up on shore, for the reason that, in some cases, other troubles have arisen. In some cases the gases formed on the " blowing " of the fuse and the heat liberated have burst the containing tube, and given more trouble than with the fuse itself. Modern practice tends rather to a good insulating handle and substantial contact pieces, as described above. On shore the fuse boards are usually enclosed in mahogany cases with glass fronts. On board ship it is better to enclose them in iron cases, or at best stout wooden cases. Fuse boards are arranged to control, say, a saloon or part of a saloon, and each of the different departments of the ship. The arrangement is also very convenient in case it is required to test for a short circuit. Sometimes warning is given that something is wrong with the insulation of cables, by smell. Rubber smells when heated, and the other substances that are employed for insulation do also, and when the well-known smells arise it is easy to remove the fuses of the different wires in succession, until the smell ceases, when a careful examination of the wire protected by that fuse should disclose the trouble.

Switches for Electric Incandescent Lamps on Board Ship.

The switch performs the same office for an electric circuit as the valve does for a steam pipe, or the cock does for a water or gas pipe. It prevents or allows the flow of current through the lamp, or other apparatus it is controlling. But the control is effected in the reverse manner to that with steam, water pipes, etc. With steam and water pipes, when flow is required, the valve is opened, and when it is required to prevent the flow the valve is closed. That is to say, when flow is required, a path is formed by opening the valve. With electrical apparatus the path is formed by closing the switch. It was explained in the early part of these articles that in order that any electrical action shall take place, a complete circuit is necessary, from the generator through the apparatus the current is to work, and back to the generator again, and that if this path is broken at any point, say by a broken wire, the current cannot pass, and the apparatus cannot work. It is obvious that the passage of the current through any apparatus may be controlled by alternately breaking a wire leading to it, and putting the broken ends into contact again. Switches are designed to perform this operation in such a manner that it may be done as often as may be required for a long period without damaging the apparatus. One of the difficulties that would arise if a lamp, say, was controlled by breaking a wire, and putting the broken ends into connection again, would be that the broken ends would gradually get shorter, because portions of them would be burnt away every time the circuit was opened. In addition, it would be difficult to arrange that the broken ends were always out of reach of each other when the lamp was out. A properly designed switch provides for all this. The design of switches has gone through the usual developments, and has settled down to pretty well one form. There is always a base of insulating material, highly glazed porcelain or highly glazed vitreous earthenware in the case of smaller switches, marble or enamelled slate, sometimes porcelain, in the case of larger switches. The base is arranged to be fixed in any convenient position, such as against a bulkhead. Upon the base are held two fixed contact pieces, to which the severed ends of the wires referred to above are connected. The connections to the contact pieces are made by cleaning the ends of the wires from all insulating material, and passing them either under flat-headed screws, provided for the purpose, or through holes in brass blocks, in which substantial screws hold them, the flat-headed screws and the brass blocks forming part of the fixed contacts. On the base, also, there is a moving contact bar. It is held by a fixed bracket, and is either operated by a handle of insulating material or there is some insulating material introduced between it and the handle by which it is worked. In the larger forms of switches the handle itself is of insulating material. In the smaller forms insulating material is introduced between. In either case the contact bar, when the circuit is open and no current passing, is held well clear of the fixed contact pieces, and when it is desired to close the circuit it is moved down and forced between the two fixed contact pieces, the current then passing from one contact piece to the other through the contact bar.

The important part in the construction of a switch is the provision for extinguishing the spark which always passes when a switch is opened, and for preventing the burning of the parts of the switch which follows if the spark is allowed to persist and the arc, which then always follows, is allowed to be set up. In the early forms of switches it was very common to see metal contact pieces that had run like water. The intense heat of the arc that had been produced when the switch was opened had melted them as in a furnace. It should be mentioned that when a circuit is opened there is a powerful inductive effect produced, particularly where there are any electro-magnets in the circuit, and that this leads to the passage of a spark between the severed ends of a conductor that is broken, and between the separating parts of a switch that is being opened. In modern switches the moving contact bar is made to leave the fixed contacts very quickly, and to a distance quite beyond that across which an arc can be formed. A small spark always passes, even with the very best forms of switch, but if the contact bar moves quickly, and quickly gets out of range, the injurious effect is very small, and modern switches go on working continuously for a very long time.

For small switches to control individual lamps, or small groups of lamps, as in cabins, saloons, etc., what is called the " tumler " or " tumbler " switch is used. There are the glazed porcelain base and fixed contacts described above, and the moving contact is operated by a small lever, pivoted in a collar which is fixed to the porcelain base, so as to stand out clear. The collar performs the double office of carrying the fulcrum of the lever which operates the contact bar, and it also carries a metal cover which encloses the whole thing. The metal cover is usually fluted, and will be familiar to marine engineers. It has a hole in the centre, which is screwed on the inside, and which engages with a screw on the collar. The lower end of the lever operates the contact bar, as described, it being insulated from the bar by a piece of mica. The upper end of the lever is formed into a small knob, and the switch is operated by pushing the knob over from one side to the other, hence its name of the tumbling switch. The " tumbler " or " tumler " switch is almost universal on shore, and is used to a very large extent on board ship.

Mr. F. C. Gardiner, of Messrs. James Gardiner & Co., shipowners, has been appointed chairman of the Glasgow Committee of Lloyd's Registry of Shipping in succession to Mr. T. W. M'Intyre, who has been compelled to retire from that position owing to the pressure of other business. Mr. M'Intyre will remain a member of the committee, of which Mr. Gardiner has been a member since its formation.

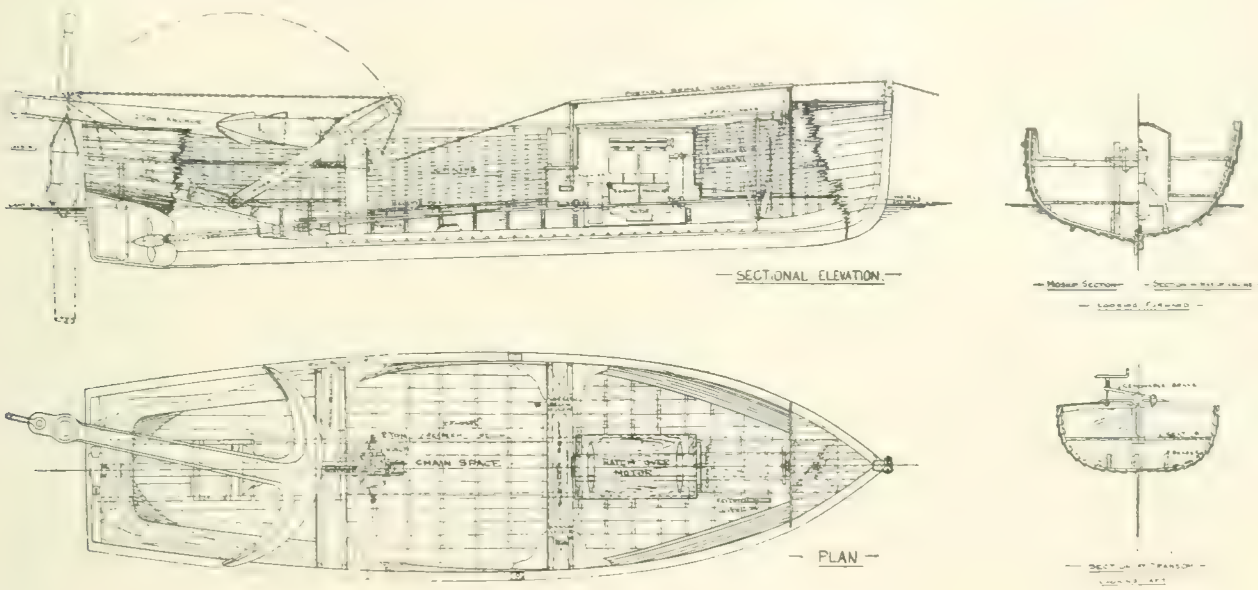
The British Vice-Consul at Canea reports that the absence of a direct line of steamers between Crete and United Kingdom ports is a drawback to British trade. Consequently importers and exporters are obliged to forward their goods *via* Piræus or Syra. Agricultural products are exported to the United Kingdom in sailing ships, a method somewhat inconsistent with the requirements of modern commerce.

MR. SHACKLETON HONOURED BY TRINITY HOUSE.—Not the least notable among the honours which are being showered upon Mr. Shackleton, the Antarctic explorer, is that which is to be paid him by Trinity House. Mr. Shackleton has accepted an invitation to become a younger brother of that ancient corporation. The letter of invitation intimates that the bestowal of this honour has the entire approval of the Prince of Wales, the master.

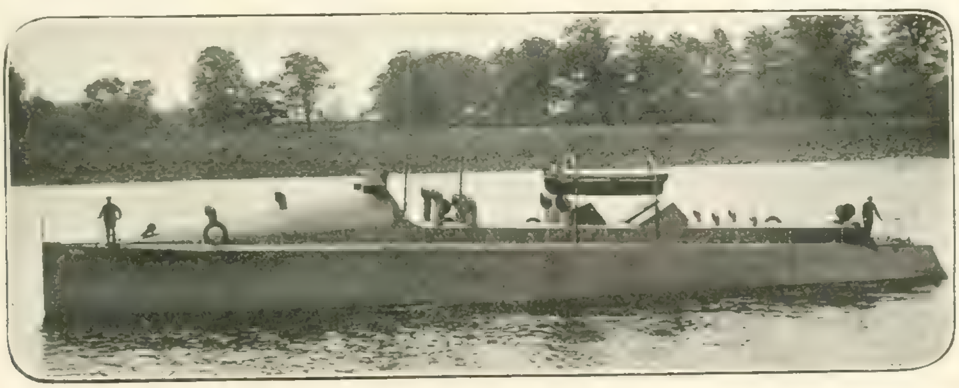
S.S. Netherton.—On page 477 we give an illustration of the *Netherton* as she lies in dock at West Hartlepool, and we refer to the vessel under Tees and Hartlepool notes.

MOTOR NOTES.

A MOTOR ANCHOR BOAT.—The uses of the modern motor boat are, to quote a somewhat trite phrase, "many and various." The latest application of the internal combustion engine to commercial work has been carried out by the enterprising Dumbarton firm of MacLaren Bros., and consists of an anchor boat to facilitate manœuvring with a powerful dredger. The dredger has recently been built by a Port Glasgow firm for service in South America, and it was deemed advisable to devise some more efficient manner of carrying out mooring operations than by the old method of employing a rowing boat with the anchor slung at the stern. Dredging operations require frequent changes of position and much time is lost in the raising and dropping of anchors in the old-fashioned way. The advantages, therefore, of a motor boat capable of a good average speed, requiring but two hands for all operations, are obvious. The problem of designing a suitable boat is not, however, altogether simple, as the anchor, which weighs two tons, and the chain which weighs another $1\frac{1}{2}$ tons, must, for convenience, be carried in the stern. The difficulty to be overcome was to prevent the boat going down too far at the stern when loaded, and dipping her stem too deeply when unloaded. By a happy combination of full lines above and fine lines below, the necessary displacement and extra buoyancy were obtained without any great variation in the level of the gunwale, whether the load was being carried or not. The dimensions of the launch are 30 ft. by 8 ft. 6 in. beam and 4 ft. in depth. It is clincher built and the scantlings are very heavy. When loaded a freeboard of 18 in. at the stern is obtained. The boat is entirely open except for a short deck forward, while thwarts are fitted similar to the usual harbour rowing boat. The engine is a 30-h.p. four-cylinder Maudsley situated amidships under a water-tight cover, giving a speed of six knots through a reversible propeller. All control levers, steering wheel and reversing gear are situated immediately to the rear of the engine case, so as to leave a clear space aft for the anchor chain. The chain space is well clear of the shaft and is supported by heavy bearers. At the stern is a cathead and two-ton hand ratchet winch, the anchor being carried with its head and stock projecting over the stern board and the flukes inboard. When the order is given to let go, the cathead, which is an 8 ft. or 9 ft. beam with a sheave in the head and hinged at the heel, is brought into action and by means of the winch the anchor is dragged along the iron-bound gunwales and lowered over the stern. On trial the boat proved thoroughly capable for the work for which it had been designed, picking up and dropping the anchor with certainty and despatch. The illustrations show the lines of the boat and the manner in which the anchor is lifted and dropped over the stern.



Motor Anchor Launch



High-speed Sea going Torpedo Boat. See p. 474.

MOTOR LAUNCH.—Messrs. R. M'Allister & Sons, Dumbarton, put into the water on June 14th a motor launch named *Minoru*, designed by Messrs. Wallace & Co., Glasgow, to the order of Mr. A. Pottie, Innellan. The launch is 35 ft. long and has a handsome saloon amidships with pantry forward and sleeping accommodation at fore end. She will have an 18-20 b.h.p. motor and reverse gear, of Messrs. Thornycroft & Co.'s latest pattern. The saloon, which is lighted by a raised roof overhead with large plate-glass window, is panelled in waxed oak and tastefully upholstered. The vessel will be fitted throughout with electric light, and she has all the latest outfit and appliances for comfortable cruising.

HIGH-SPEED SEA-GOING TORPEDO BOAT.—We show an illustration of a high-speed sea-going torpedo boat or gunboat propelled by internal combustion engines of the Yarrow-Napier type, which has been constructed by Yarrow & Co., Ltd., of Scotstoun, Glasgow. This vessel has recently been running her trials with great success. Her length is 100 ft., beam 13 ft. 6 in., and speed 23½ knots. Messrs. Yarrow and Co. have also recently constructed two vessels for the Austro-Hungarian Government, and are now building the machinery for two further vessels for the same Government. They also constructed, a short time ago, a 60 ft. motor torpedo boat for the British Government.

THE GROWTH OF THE MOTOR LAUNCH INDUSTRY is evidenced again by the notices issued at the end of May by the Board of Trade as to the survey and certification of motor boats. They must, however, work under considerable restrictions. Those which take passengers are only to ply in fine weather and in daylight, and a written undertaking that this rule (and any local restrictions that may be in force) will be obeyed, must be given by the owner. At least two men of experience must be provided to take charge of the working and navigation of the craft, and the provisions of the Life-Saving Appliances Rules must be followed out.

WRECK OF H.M.S. "SAPPHO."—Once again the motor boat has proved its reliability and value in time of danger, and the honour falls this time to Mr. Bates' motor boat *Alert*, which did yeoman service in the salvage operations during the anxious period following on the collision between H.M.S. *Sappho* and the merchant vessel of the same name. The *Alert* has only just been delivered to Mr. Bates and is fitted with a set of Ailsa Craig motors, made by the Ailsa Craig Motor Co., of Chiswick, London. These engines have many such records to their credit, and the numerous rescues in which Quartermaster-Sergeant Huskisson's Ailsa Craig engined boat has figured at Yarmouth, Isle of Wight, must be fresh in many people's memory. It is not so very long ago either that the Ailsa Craig motor boat *Barney*, in the north of Scotland, saved the lives of several fishermen near Lerwick during a fierce storm in which their own boat had been capsized.

MARINE OIL ENGINES—A SWEDISH MOTOR VESSEL ON TOUR.—With reference to the article that appeared in our May issue under this heading, regarding the demonstration of motor fishing vessels round the coasts, we learn that Messrs. Norris and Henty sent a fishing boat round the coast very nearly two years ago, and quite recently the same firm had another boat touring the North. A Thornycroft engined boat also recently visited the leading fishing ports north of Berwick. Two months ago it was announced that one or two other English firms were equipping boats for the purpose of demonstration. Going further back, however, it appears that a demonstration of a Scandinavian engine was organized by the Scotch Fishery Board some four or five years ago. But apparently this engine did not come up to the expectations of the fishermen, for no success attended the Fishery Board's enterprise. The Scott Steam Motor firm of Paisley have also had a boat out on the same mission.

Brussels International and Universal Exhibition, May to October, 1910.—In next issue we shall give particulars of information that so far has been given out by the Exhibitions Branch of the Board of Trade regarding the progress that has been made for the convenience of British exhibitors at this exhibition.

The Slavonia.—Under "Fleets of the Mail Lines" will be found particulars of the loss of the *Slavonia*, the Cunard boat.

Industrial and Trade Notes.

THE CLYDE AND SCOTLAND.

(From our Own Correspondent.)

Steel Prices and Quickened Trade.—The important conference between the English and Scotch steel makers and shipbuilders, held at the latter end of May, has resulted in at least a relaxation of the strained relations which existed, and there have not been wanting signs of quickened activity on the Clyde in shipbuilding and iron and steel industries generally. A material reduction of 10s. per ton in the case of steel plates and angles was made by the Scotch makers. By this concession and a readjustment of prices in the South all the districts are now on the same footing. The preference given to Irish firms, under the new agreement no longer exists.

New Contracts.—Since the date of writing the notes in last month's issue, a fairly good amount of new shipping has been contracted for with Clyde builders, most of it of the cargo carrying order, and most of it, as usual, being placed with firms on the lower reaches of the river. Messrs. Russell and Co. are to build a steamer of 10,000 tons deadweight carrying capacity and 400 ft. in length for the Lyle Shipping Co., Greenock, the engines for which will be made by Messrs. Rankin & Blackmore, Greenock. Messrs. Wm. Hamilton and Co. are to build a steamer of 400 ft. in length and 8000 tons deadweight carrying capacity, for a Liverpool firm. The vessel will be constructed on the Isherwood principle, for which Messrs. Hamilton & Co. are licensees. The Greenock and Grangemouth Dockyard Co. have received from Belgium owners an order to construct a first-class cargo steamer of 7000 tons deadweight carrying capacity, machinery for which will be supplied by a Glasgow firm. Messrs. A. Rodger & Co. are to construct two steamers of large tonnage, the machinery for which will be supplied by the builders from their Govan Works. Messrs. Alexander Stephen & Sons, Ltd., Linthouse, are to build and engine for the Australian United Steam Navigation Co. a twin-screw steamer of about 6400 tons gross, somewhat similar to the *Wyreema*, which was built at Linthouse last year for the same owners. Messrs. Mackie & Thomson, Ltd., Govan, have received from Mr. John Kelly, Belfast, an order for a screw steamer of 500 tons carrying capacity; machinery will be supplied by Messrs. Muir & Houston, Glasgow. Messrs. Wm. Simons & Co., Renfrew, are at present executing an order recently received from the Irrigation Department of the Soudan Government, for a specially designed dredging vessel, which will be principally employed dredging the sudd (material of a fibrous nature) which is found in the White Nile. Owing to the limited depth of water at some of the places where dredging operations are to be carried on the vessel will be of very light draught, and will be propelled by a paddle wheel at the stern. The Greenock and Grangemouth Dockyard Co. have contracted to build a coasting steamer of 450 tons for Austrian owners, which will be built at their Grangemouth yard.

Work at Port Glasgow and Greenock.—While in many of the yards bare poles are too common, this being especially noticeable in the large establishments of Messrs. Caird and Co., where there is nothing on hand—most of the yards are fairly well off for work. In the Scott shipbuilding yard, besides the berth now being occupied with the "Dreadnought," work is progressing on two steamers, each of 7,700 tons, to the order of the Clyde Shipping Co., and a medium-sized steamer for the Carron Co. In the case of Messrs. Russell and Co., there are no fewer than a dozen large hulls under construction. Messrs. Wm. Hamilton also have their stocks fairly well occupied, four of the six steamers underway being constructed on the Isherwood principle. Messrs. Ferguson Bros., whose specialities are dredgers and tug-steamers, have four of their berths occupied, two items being powerful dredgers for the London and North-Western Railway Co. A third dredger is a vessel for Colonial owners.

The Clyde Shipbuilding and Engineering Co. have two vessels on their stocks, and while not so busy in this department, continue to be fully employed in their engineering branch. One of their most recent contracts is to supply triple-expansion engines for a cargo steamer of 4000 tons deadweight, the hull of which is being constructed at Trieste to the order of Mr. Libera, of Trieste.

Naval Work on Hand.—Preparations have now been well advanced for the construction of H.M.S. *Collossus*, the battleship of the "Dreadnought" class which is to be built by Scott's Shipbuilding and Engineering Co., Greenock. The massive keel blocks for the vessel have been laid, extending in length to about 546 ft.; those on which the bow of the *Collossus* will rest are 10 ft. high and towards the stern the blocks are about 10 ft. in height. The keel plates have been delivered at the yard and it is expected that they will be put into position early in the present month. The tugboat *Rambler*, built by Messrs. John Brown & Co., Ltd., Clydebank, is reported ready for delivery, and is ordered to be stationed at Dover. The *Rambler* is of 690 tons displacement. Her engines, of 1250 h.p., drive her at a speed of 12·25 knots. Other naval contracts underway on Clyde stocks are—a first-class cruiser at Fairfield works, a sister cruiser at Messrs. John Brown & Co., Ltd., Clydebank, three torpedo destroyers at Fairfield and three at Clydebank, all being for the British Navy. In addition the Fairfield Co. and Messrs. Wm. Denny & Bros., Dumbarton, have each two torpedo destroyers to the order of the Commonwealth Government, while Messrs. Yarrow & Co. are still engaged on five of the set of ten torpedo destroyers which they are constructing for the Brazilian Government.

Naval Contracts and "Fair" Wages. — *Apropos* the above reference to the building of the "Dreadnought" at the Scott shipyard, a question was put to the First Lord of the Admiralty in Parliament on June 17th as to the wages paid to labourers in this establishment. The question ran:— "Was he aware that on a yard on the Clyde where a "Dreadnought" is to be built the maximum wages paid to labourers is 18s. per week of fifty-four hours, and that in other yards on the Clyde where Government work has been done the minimum wage for the same class of labourers is 20s. per week; and whether as the cost of living is the same in all the Clyde districts, he will insist upon all shipbuilders executing Government orders paying a minimum wage of not less than 20s. per week to adult labourers?" Mr. M'Kenna replied that the fair wages clause in the contracts for building His Majesty's ships will be strictly enforced; and if any information of a detailed character admitting of investigation be furnished to the Admiralty, enquiries will be made and action taken with a view to enforcing the fair wages clause.

Naval Gun-making in Glasgow.—There was despatched on June 17th from Messrs. Beardmore's works, Parkhead, the first modern gun made in Scotland. This is a 4-in. B.L. gun of wire-wound construction, 50 calibres in length. It throws a 30-lb. projectile with a velocity at the muzzle of 3,000 ft. per second. There is a 12-in. 50-calibre gun of 70-tons weight approaching completion at Parkhead, which is one of those intended for the latest pattern of "Dreadnought" battleship.

Clyde Shipbuilder for Hong Kong.—Mr. Robert Morton Dyer, second son of Dr. Henry Dyer, the well-known expert in engineering science, Glasgow, has been appointed chief manager of the Hong Kong and Whampoa Dockyard Co. Mr. Dyer, who holds a degree in science of the University, served his apprenticeship as a shipbuilder in the yard of Messrs. A. & J. Inglis, Pointhouse, Glasgow.

Scottish Shipyard Workers for Abroad.—Some time ago forty shipyard workers from Dundee and sixty from the Clyde left for Trieste, where a number of large contracts are on hand. Another group has recently left Dundee composed of platers, helpers, riveters, hole-borers and carpenters. The immediate causes behind this exodus of Scottish shipyard artisans from their native shores are the efforts at expanding, by means of Government subsidies, both the shipping and the shipbuilding of Austria, and especially so at the port of Trieste. Two of the three large shipbuilding concerns there, the Austrian-Lloyd's works and the Stablinento Technico, are in a fair way of being merged in the newer and larger enterprise of the Cosulich firm, who have established, and are now seeking to greatly expand, a shipbuilding establishment at Monfalcane, some thirty or forty miles from Trieste. This establishment is named the Cantiare Navala Triestino, and Monfalcane is already the seat of the Dual Monarchy's most prosperous shipbuilding industries. The administration of the "large and still growing" yard here is in the hands of Clyde-trained men, but, as above indicated, many of the operatives employed are from Dundee (which has supplied recently a number Austrian-Lloyd steamers), and even from the yards of the North-East Coast, from which district, also, steamers have been added to the shipping of Trieste and neighbourhood. Should the proposed amalgamation between the Austrian-Lloyd, the Stablinento Technico and Cantiara Navala Triestino, be carried out, the resulting establishment at Monfalcane will be one of great extent and working capacity.

British Designs for Foreign Navies.—While on the subject of the migration to foreign countries of British operative skill in shipbuilding and engineering, it is pertinent to take note of the fact of British brains and experience being also enlisted in the up-building of foreign navies. An example of this is provided in the fact that on June 16th the keels of the four "Dreadnoughts," which are to represent the nucleus of Russia's future Navy, were laid down in St. Petersburg. The materials to be employed will be Russian throughout. The designs and supervision will be British. Great difficulties were experienced in selecting the designs. Last year the choice seemed to lie between Hamburg and Italian designs, but the superiority of those offered by British firms became apparent, and last year a representative of Messrs. John Brown & Co., of Clydebank and Sheffield, obtained the contract, which, however, was kept a secret. The contract involved responsibility for the construction of sister ships of 23,000 tons, with a speed of 23 knots and turbine engines. Russian engineers and architects went to Messrs. Brown's yard for technical instruction. Orders have been placed in Russia for the material, so that the vessels may be launched in an advanced state within a couple of years.

Greenock Admiralty Torpedo Factory. — Operations in connection with the Admiralty torpedo factory at Battery Park, Greenock, were commenced about ten months ago by Messrs. R. Neill & Sons, Manchester, and although the preparation of the site involved considerable labour, including the drainage of ground, the construction of a great retaining wall along the sea front, and the formation of a subway connecting Fort Matilda with the new factory, work is now progressing on the main blocks of buildings, and there is every prospect that the factory will be completed within the specified time of eighteen months.

Submarine Base at Dundee.—The Admiralty have now completed negotiations with the Dundee Harbour Trustees for the establishment of a submarine base at Dundee. Under the agreement which on May 28th was ratified by the Harbour Trustees, the Admiralty will pay £4,000 per annum for the exclusive use of the West Graving Dock and partial use of the adjacent wet dock by submarines and tenders. The agreement holds for five years, with power to renew.

Leith Docks.—Leith Dock Commission are to include in their estimates of expenditure £11,000 for a new crane. It is proposed that the crane shall be erected on the north side of the Imperial Dock, and it shall be capable of lifting 100 tons with a jib 60 ft. in length and having a radius of 36 ft.

Lloyd's Register Surveying Staff.—In connection with the transfers and promotions now taking place in the district staffs of Lloyd's Register of Shipping, owing to the retiral, on age limit regulations, of Mr H. J. Cornish, the surveyor-in-chief, Mr. James Mollison, chief engineer-surveyor in the Clyde district, and others, a presentation was recently made, by his office colleagues, to Mr. Allan M'Keand, ship and engineer-surveyor in the Clyde district, who is, after nineteen years' service there, being transferred to Newcastle-on-Tyne. Mr. M'Keand is a Clyde man, having been educated at Glasgow and served his apprenticeship with Messrs. James and George Thomson, Clydebank. He was some time in the service of the British Indian S. N. Co., and subsequently with Messrs. Morton & Williamson, consulting engineers and naval architects, joining Lloyd's Register in 1890.

THE TYNE.

(*From our Own Correspondent.*)

Proposed Industrial Exhibition.—The idea of holding an industrial exhibition in Newcastle, during the summer of 1910, has been mooted recently, and appears to have been well received in commercial circles. The last exhibition, which was financially and otherwise a great success, was held in 1887, in a building, or series of buildings, specially erected for the purpose. There is this point of similarity between that period and the present, that trade was then, as now, in a state of extreme depression. In 1887, business was, locally, if not generally, stimulated by the holding of the exhibition, and it is probable that a similar result may be experienced if the enterprise now talked of really enters the region of the tangible. Since the date of the last exhibition immense strides have been made in shipbuilding, marine engineering and electrical engineering, and we believe that there is no district in which the development of these industries has been more phenomenal than on Tyneside. It is fitting, therefore, that on Tyneside, if anywhere, the bringing together before the first decade of the century ends, of the best examples obtainable of modern productive power in shipbuilding, marine and electrical engineering, should be attempted.

The Admiralty and the Tyne.—The persistent efforts that have been made lately to force the attention of the Admiralty to the undeniable advantages afforded by the Tyne for the establishment of a naval repairing base have not been without effect, and there is now reason to believe that a local firm will be invited, on terms of subsidy and preferential arrangements as to contracts, to provide pontoon docks, to be permanently located at Jarrow Slake, where there is abundant room for as many such docks as are ever likely to be required, and also for vessels awaiting "turns." This is a striking instance of the utility of perseverance, and it is tolerably certain that if the gentlemen who initiated the movement for furthering the claims of the Tyne, had shown any dilatoriness, the matter would have lain in abeyance, and nothing would have been done until another "scare" had aroused our men of authority from the placid contentment with things as they are, which has come to be looked upon as the normal state.

Messrs. Armstrong, Whitworth & Co.—This company have recently applied for, and obtained from the Tyne commissioners permission to carry out the important work of widening the south channel at the swing bridge, so as to admit of the safe passage of vessels having greater beam than have hitherto been built at Elswick. The fact that such an enterprise is being entered upon shows that the great Elswick firm are very confident of continued success in the future, and the general public will, no doubt, participate in the feeling of confidence.

The Palmer's Company have also received the sanction of the commissioners to a proposal for lengthening some of the building berths by running them as far into the river as may be necessary. It is evident that the commissioners are not disposed to put difficulties in the way of firms who are desirous of developing their resources, and this disposition on the part of local authorities, to help instead of hindering, will go far towards the permanent benefit of local trade.

The Wallsend Slipway Company.—This firm, whose latest engineering achievement of note was the engining of H.M.S. *Superb*, have decided to erect, on their wharf facing the river, an electrical crane capable of lifting on board a vessel lying alongside, any weight up to 150 tons. With such a powerful auxiliary to make use of it is practically certain that the time occupied in the machinery equipment of large vessels will be much reduced.

THE WEAR.

(*From our Own Correspondent.*)

Advertising the Port.—Some real efforts to make known throughout commercial communities at home and abroad, the advantages of Sunderland as a manufacturing centre are now about to be made, and from the earnestness shown by the promoters of this movement, it is not to be doubted that certain good will result. Being the chief town in the county of Durham, and situated in the centre of one of our largest coal fields, not to speak of its proximity to the sea, and its advantages in the way of easily accessible docks, there is no doubt that Sunderland is capable of great development in other industries besides shipbuilding and marine engineering, which have up to now been the staple trades. There is no need to advertise the capabilities of Sunderland, so far as these industries are concerned, for in this connection few ports can show a more honourable record. There are, however, many trades for the successful carrying on of which Sunderland, with its waterways, its railway facilities, and its near neighbourhood to the great sources of fuel supply, is particularly well adapted, and it is more than probable that the genuine endeavour, which is now to be made, to make these advantages more widely known, will ultimately have the effect of adding to the sources of employment in the town and district.

Trade Revival at Last.—There seems to be no longer any room for doubt that a revival of trade is at hand, and more especially in the shipbuilding and engineering trades. During the first week of June, it was announced that Messrs. J. L. Thompson & Sons, of the North Sands yard, had received from a well-known London shipowning firm an order for two vessels of a large class, and it is rumoured that since then some other orders have been secured. We are not in a position to confirm the rumour, but with regard to the announcement we can state that the furnaces will be lit up, and a start made with frame turning early in July. A start might have been made even sooner, but for the circumstance that the annual stocktaking is to take place in the last week of June. The news of the re-starting of this establishment is the most cheering that has come to Sunderland for many a day; for no one remembers the yard as being anything else but busy until the stoppage which occurred early in the present year. That event gave rise to a feeling of hopelessness in the locality, the general impression being that if the North Sands yard was without work, then things must be bad, indeed! It is not surprising, therefore, that a feeling of elation is now experienced, and there is not the least reason to doubt that by the resumption of work at this noted yard, public confidence in the future of trade will be immensely strengthened.

Messrs. Robert Thompson & Sons have also secured orders for vessels to be employed in special services, and as they already had a considerable amount of work in hand a continuance of briskness is assured for the remainder of the year. The large steamer *Ella*, belonging to London owners, is receiving a general overhaul at the Bridge Dockyard. The French Consulate is held at this establishment, and the powers of the Consul (Mr. C. H. Thompson) have been recently extended, so that it will not any longer be necessary for persons having business with the Consulate to go to Newcastle to transact it.

Messrs. Priestman have received an order from Messrs. Nolson, of Ghent, for two good-sized cargo boats, and Messrs. Short Bros., Messrs. Osborne & Graham, and Messrs. Pickersgill, are also said to have booked orders.

Messrs. S. P. Austin & Sons have booked an order for a thousand-ton cargo boat, and it is understood that the firm are in negotiation for other orders. Repair work still constitutes a very important item in the firm's business, and both graving dock and pontoon have been in frequent occupation this month. Large deliveries of steel material are being made to the Sunderland Shipbuilding Company, who are understood to have been the recipients of some good orders for vessels of a special class, and Messrs. Blumer also are credited with the possession of orders sufficient to keep the machinery going for some months.

Messrs. Doxford launched recently a vessel of new design, intended specially for the carrying of coal and similar cargoes. Should it prove a success as to the discharging capacity, there is every reason to expect that a big demand will arise for this type, and an exceptionally busy time at Messrs. Doxford's may, in that case, be looked forward to.

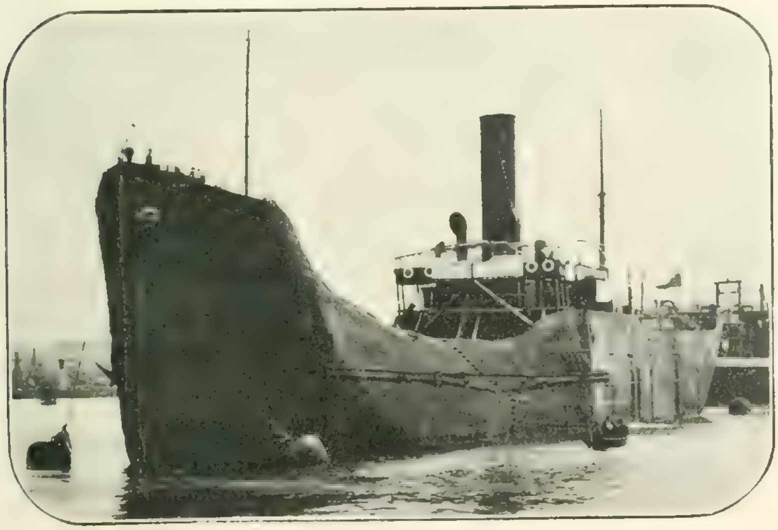
The Engineering Works.—At the Palmer's Hill Works (Messrs. John Dickinson & Sons), where slackness has existed for many months, orders for engines and boilers for the equipment of vessels that are being locally built have been received, and a busy time is looked forward to, and is being prepared for. It is, indeed, expected that early in July a night shift will be set on in some of the departments. At all

the other engineering establishments signs of improvement are visible, and the improvement is being reflected in the condition of affairs at the local foundries, all of which are reported to have booked orders. Makers of auxiliary machinery for steamships are also becoming busier, and coppersmithing establishments are showing tendencies in the same direction. Business at the docks is showing distinct improvement, timber imports being steadily on the increase.

THE TEES AND HARTLEPOOLS.

(*From our Own Correspondent.*)

Middlesbrough.—Nothing important has occurred during the month. Messrs. Raylton, Dixon & Co. have secured an order from Messrs. R. & J. H. Rea, the managers of the Rea Steamship Co., Ltd., to build a steamer for their general trade, also a further order for a large barge for the Rea Transport Co., Ltd., and Messrs. Harkess are reported to have secured an order, but prices remain very low, enquiries in all cases being for special work. It is reported that Messrs. Richardson, Westgarth & Co., have secured three contracts for blowing engines, two being steam-driven and one motor-driven, also a good order for Nesdrum water tube boilers, which are gaining favour for land work.



S.S. *Netherton*. See Tees and Hartlepools Notes.

Stockton and Thornaby.—Trade remains very quiet here, Messrs. Craig, Taylor & Co., and Messrs. R. Ropner & Sons, are both reported to have secured a contract each for cargo boats. Messrs. Blair are said to be fairly busy, but with nothing like their usual output.

Stockton.—Owing to the severe depression in the engineering trade the directors of Messrs. Head, Wrightson and Co., Ltd., report that for the first time within thirteen years they are unable to recommend a dividend on the ordinary shares, thus emphasizing the state of trade both locally and generally.

West Hartlepool.—Work is still very scarce here. During the month Messrs. W. Gray & Co. are reported to have secured the contract to build a cargo boat. They have been fairly busy on repair work, but their Central Marine Engine Works have not been so slack for a long time. They have launched the last of the two boats built to the order of Messrs. Furness, Withy & Co., and of the hundreds of steamers built by this firm, they are reported to be the only boats ever built by them to the British Corporation survey requirements. Messrs. Irvine's Shipbuilding & Dry Dock Co. have secured the contract to build a small steamer on the berth recently vacated by the s.s. *Broomhill*, at their harbour shipyard. Their dry dock has been kept employed, several steamers during the month having been overhauled and repaired. The s.s. *Netherton* is lying in the Union Dock alongside Birts Quay, and presents a very striking spectacle. It will be remembered that this vessel was wrecked by an explosion of benzine, off Singapore, in 1907. She has been bought by Messrs. W. H. Loveridge & Co., who engaged Mr. Russel, of this port, to go out to her. After undergoing temporary repair she proceeded home under her own steam. Though only drawing about five of water she has completed what may be considered a noteworthy voyage of about 8,500 miles. In the issue of this journal of October, 1907, we gave illustrations of the condition of the ship after the fire.

Hartlepool.—Messrs. Richardson, Westgarth have secured the order for the engines and boilers of the boat to be built at Messrs. Irvine's harbour shipyard. They are also very busy in their contraflo condenser department and turbine shop, but are only fairly busy in their other departments. At Messrs. Irvine's Middleton shipyard the keel is being laid for the third steamer for Messrs. Elder, Dempster & Co., whilst the other two steamers to Messrs. Furness, Withy & Co.'s order are nearly completed. Their dry dock has been busy during the month on repair work. At Wingate, on June 22nd, Sir C. Furness Co. partnery scheme was refused by the men; the decision would be conveyed to Sir C. Furness by their county officials and also by the officials of the Wingate Lodge.

THE HUMBER AND DISTRICT.

(*From our Own Correspondent.*)

Messrs. Earle's Shipbuilding and Engineering Co., Ltd.—This firm is, like many of the north-east coast yards, lacking new orders, but they have been fairly busy with repair work.

Central Dry Dock and Engineering Co., Ltd., have been very successful in keeping up their reputation in dry docking and repair work for this last month. They have been successful in securing the docking of the s.s. *Humber*, Lancashire and Yorkshire Railway Co. steamer, which will be a heavy and expensive repair, caused, as will be remembered, by running down and sinking the German steamer *Modena*, in the North Sea, two of the crew being drowned.

Messrs. Cooper & Co., Engineers and Boilermakers, have been very successful in docking and repair work, and still have sufficient repair work at present.

Messrs. Amos & Smith, Engineers and Boilermakers, report trade quiet, but always more or less repair work for Wilson Line and other steamship companies, steam trawler companies and building their well-known steam-steering gears.

The fishing industry of the Humber ports, do not seem at the present to be giving out fresh orders for trawler building.

Board of Trade.—Joseph King, Lieut. R.N.R., F.R.G.S., younger brother of the Trinity House, Hull, holds the highest certificates possible for a man in the mercantile marine. In the early part of 1903 he was appointed Examiner of Masters, Mates and Fishermen for the ports of Hull, Grimsby, Scarborough and Boston, and retained the appointment until the present year, when he was transferred by the Board of Trade to their staff of nautical surveyors, and appointed to the port of Cardiff. He is a well-known Freemason, Humber Lodge 57, a great reader (in more languages than one) and has spent a great deal of time on the subject of early shipping. We wish Captain King health, strength, etc. Cardiff gain and the Hull loss. We fully expect in after years he will let his anchor drop somewhere around the Humber shores.

Sale of Local Vessels.—The iron s.s's. *Oxford* and *Essex* have been sold to be broken up. The following steam trawlers have been sold: *Frusland* (ex. *Balmoral Castle*), to Mr. Arthur Smith, Grimsby; the *Ferret* to Mr. A. Bannister, Hull. The coasting steamer *Nell Jess*, having sailed from the Humber ports regularly, has been sold to Messrs. Gilchrist and Co., of Liverpool.

SOUTHAMPTON.

(From our Own Correspondents.)

Messrs. Summers & Payne, Ltd.—The Duke of Westminster's steam yacht *Grianaig*, R.Y.S. is under orders for Kiel, where the Duke will race with *Ursula* (formerly *Wolseley Siddeley*). This boat has proved herself faster in home waters than in the Mediterranean, where she beat all comers and established a record as the fastest boat of her size in the world.

The Germans have built and engined two new boats to race against her at Kiel.

Lord Normanton's *Allah Karim*, R.Y.S., has been let to a German yachtsman, and arrived at Cuxhaven about the middle of last month.

Lord Lonsdale's *Norseman*, R.Y.S., has completed her outfit and is awaiting a charter.

Sir Maurice FitzGerald's *Julnar*, which was launched in May last, has been out cruising on several occassions, and last month the Duke of Wellington and the Marquis of Ormond were guests of Sir Maurice.

Mr. Morton F. Plants s.y. *Iolanda* sailed last month for Hunter's Quay, and after the Clyde fortnight will proceed to Norway.

Calisaya, Mr. N. J. Ede, was commissioned and left the yard last month.

Messrs. Day, Summers & Co., Ltd., Northam Iron Works.—The new steam yacht *Ulna* (226 tons) completed a very successful trial trip in May last, and left the yard of the builders on the 7th of last month. The guaranteed speed was 11 knots per hour and on trial the mean speed was 11·85 knots, and the highest speed on any one run was 14 knots, so that the contract speed was considerably exceeded. The yacht has been built and despatched within six months, as the plates and angles were not delivered at the yard before January. She is the second yacht Messrs. Day, Summers and Co. Ltd., have bult for the same owner (Col. Gascoigne), the previous yacht being of 124 tons measurement.

The Duke of Sutherland's s.y. *Catania*, 668 tons, was dry docked last month and is now lying off the yard completing her refit.

Mr. Alfred Farquhar's s.y. *Medusa*, 627 tons, has been on the slip for repairs and is now completing her refit for charter.

Mr. J. Mann Thomson's s.y. *Vanduara*, 450 tons, has been slipped and completed her refit and sailed about the middle of last month.

Messrs. J. I. Thornycroft & Co., Ltd., Woolston, have recently completed the steam yacht *Napsugar* for Mr. Alfred Brull, of Budapest. The yacht proceeded to her destination *via* the Rhine and through the canals. She has been specially designed and built for river service and is of the following dimensions: Length, 71 ft. 3 in.; beam, 11 ft. 6 in.; and has a draught of 3 ft. The speed attained on trial was 10½ miles per hour. The yacht is built of steel and has a very smart appearance, having a clipper stem and carved scroll work.

The following Government work is also in hand: The H.M.S. 33-knot destroyer *Nubian* will be running her trials this month, and the 27-knot destroyer *Savage* is well advanced and is now plated.

The large steam yacht for Lord Leith was launched last month.

Repairs and overhauls have been carried out to the s.y. *Liberty* (owner, Mr. J. Pulitzer), s.y. *Emerald* (owner, Sir Christopher Furness), s.y. *Albion* (owner, Mr. C. L. H. Loeffler) and to the p.s. *Lady Rowena* and several other vessels.

New Mail Steamers.—Two new mail steamers sailed from Southampton last month, one of them being the *George Washington*, the largest vessel flying the German flag and also the largest sailing from this port, and the other being the Elder Dempster steamer *Bruxellesville*. The Elder, Dempster steamer *Bruxellesville* displaces a former steamer of the same name, on which she is a great advance. A new sister vessel, the *Leopoldville*, which displaced a former vessel of the same name has also been placed on this service, and it is anticipated that there will be a big development in the trade to and from the Congo and Teneriffe.

The City of Cork Steam Packet Co. have just added to their fleet the s.s. *Ardmore*, for their passenger and cargo service to this port. The accommodation provides for 84 first-class passengers, situated on the upper deck amidships, and 60 third-class passengers. Refrigerated chambers are installed for the carriage of butter and other dairy produce from Cork to this port. Particulars can be had on application at the local office of the Company of special tours to the South of Ireland, in connection with their steamers.

THAMES.

(From our Own Correspondent.)

Dock Co.'s Last Dividend.—The dividend of the London and India Dock Co. is a matter of some general interest, as owing to the transfer to the port authority this is the final one. The account for the last quarter up to March 31st, shows a balance of £52,967, but as the dividend is limited to 3 per cent., absorbing £36,021, according to the Act, the balance, £16,945, goes to the port authority.

Steamship Co.'s Reports.—The P. and O. Co. declare at the rate of 5 per cent. on the preference stock and also an interim dividend of 7 per cent. on the deferred stock. The general programme of this company for the autumn is formulated, showing the part the new M class of boats will take. The Australian service will be wholly by these boats and the Bombay service chiefly so. The Orient Co. declare a dividend of 5 per cent. on the deferred shares and the revenue for 1908, after allowing for depreciation, shows a balance of £31,926. The *Orsova*, the first of the new boats, has arrived in the Thames. Her speed on trial was 18 knots. The Union Castle Co. paid 6/- per share on the ordinary £10 share, making 10/- for the year 1908. The Royal Mail Co., after meeting charges and allowing for depreciation, pay 2 per cent. on the ordinary shares.

New Steamer for Thames.—The General Steam Navigation Co. has made an addition to its fleet in the *Golden Eagle*, built by Messrs. John Brown, of Clydebank. This company has recently opened new offices at Trinity Square, which was attended with some ceremony.

L.C.C. Steamboats.—A public auction of these boats took place recently at the Baltic sale rooms, and the *Carlyle* and *Vanbrugh* were sold at £990 each, as also the *Caxton* at £975, and by last accounts the *Boydell* and *Purcell* have also been sold at £990 and £980 respectively. There is, therefore, a large number of boats still on hand.

Fleet's Visit to Thames.—The programme arranged for our fighting fleet to visit the Thames is one of unprecedented magnitude. The review that has usually been at Spithead will, on this occasion, be in the estuary of the Thames. There will be 144 vessels in all, embracing the Home and Atlantic fleets, with three cruiser squadrons. Included in this array will be all types down to submarines, and the line will extend up to Westminster Bridge. The vessels will remain for about a week, and various entertainments are arranged for during the period of the stay.

The "Port Jackson" Training Ship.—This vessel has arrived in the Thames from Sydney, recently, with her thirty cadets, having made the homeward voyage after leaving port on February 10th, *via* Cape Horn and the Azores. The vessel is a clipper four-masted barque, and is now unloading in the South West India Dock, whence she will sail again in August on a fresh voyage.

Thames Yachting.—The Royal Corinthian Club had a match for fifteen-metre yachts, and a handicap for those of 25 tons Thames measurement. The course was from Port Victoria, round the Nore lightship and back. The Royal Thames Club had a race from the Nore to Deal. In the twenty-three-metre class the *White Heather* was first in, while with the fifteen-metre class *Vanity* took the prize. The course was over fifty miles, and close sailing occurred.

MERSEY AND MANCHESTER DISTRICT.

(From our Own Correspondent.)

Repair Work.—Repair work during the past month has been fairly brisk, but it has been divided mostly between Messrs. H. & C. Grayson, Ltd., and Messrs. Cammell, Laird and Co., Ltd. The former firm are carrying out extensive repairs to the s.s. *Southern Cross*, to damage which has been caused by fire. She is undergoing large boiler repairs, including new furnaces throughout. Messrs. Grayson have also in hand the Canadian Pacific Railway liner *Lake Champlain*, which is having a large number of plates renewed, in consequence of the damage she received through colliding with an iceberg in the St. Lawrence. At their Birkenhead yard they have just completed extensive repairs to the Trinity House boat *Siren*, also the New Brighton lifeboat *Queen*. Messrs. H. & C. Grayson have also distinguished themselves again during the month with the smart docking of the s.s. *Everton Grange*. Just as the vessel was about to sail it was thought that a rope had become entangled with the propellers, but on sending a diver down he reported nothing to be amiss. The owners, however, decided to dry dock the vessel, and Messrs. Grayson were entrusted to do this whilst the vessel was fully loaded. They managed the work successfully, however, by preparing special hardwood blocks, fitted between permanent iron blocks, which were fitted and secured in position by iron dogs.

Cammell, Laird & Co., Ltd.—This firm have a large number of contracts on hand in their repair department, including the Sunderland steamer *Leitrim*, the Isle of Man S.P. Co.'s s.s. *Empress Queen* and *Mona*, and the s.s. *Calgate*, belonging to Messrs. R. & J. H. Rea. They are also pushing ahead with the repair to the bridge for New Brighton Pier, which is now lying on their quay at Tranmere. I also understand that the Union Castle liner *Dunottar*, which has been chartered for Dr. Lunn's Norwegian tours, will shortly be undergoing considerable overhaul and repairs at the hands of Messrs. Cammell, Laird & Co., Ltd.

The new Nelson liner is now progressing very quickly, and the new Wallasey ferry boats are well in hand. Messrs. Cammell, Laird & Co., Ltd., have also received the order for a new ferry steamer for the Havana Central Railroad Co., which is to be of the American type, being double-ended. She will be fitted with propellers at both ends, and have three decks. The length is to be 140 ft. and the breadth 55 ft.

On Monday, the 21st May, Messrs. Cammell, Laird & Co., Ltd., launched from their Birkenhead yard a new addition to the fleet of coal elevators belonging to the Clark's Patent Coal Barge Co., Ltd., this vessel being the third which Messrs. Cammell, Laird & Co. have built of this type for this company. This latest vessel, however, differs slightly from the other vessels of the fleet in being built on the Isherwood longitudinal system of construction.

The Isle of Man Steam Packet Co., Ltd.—Messrs. Cammell, Laird & Co., Ltd., have received the order for a new steamer for these people's winter service to the Isle of Man. The new vessel will be slightly larger than their s.s. *Tynwald*, with a tonnage of 1500 and a speed of 19 knots. She will have a cargo carrying capacity of about 650 tons, and passenger accommodation for 1500 passengers.

Vogt & Maguire.—These people have placed an order (on behalf of foreign owners) for two new steamers with Messrs. J. Priestman & Co., of Sunderland, with engines by Messrs. the North-Eastern Marine Engineering Co., Ltd., also another vessel with Messrs. J. D. Haene & Co., of Antwerp.

T. & J. Harrison have placed an order for a new steamer with Messrs. Workman, Clark & Co., Ltd., and I understand that another vessel has been placed with Messrs. Connell and Co., of Glasgow, with engines by Messrs. Dunsmuir and Jackson. The chief dimensions of the vessel placed with Messrs. Workman, Clark & Co., Ltd., are as follows:—Length, 350 ft.; breadth, 46 ft.; depth, 29 ft. 6 in. Engines 20 in., 34 in. and 58 in. by 48 in. stroke.

R. & J. H. Rea.—This firm have placed an order for a new vessel for their coaling fleet with Sir Raylton Dixon and Co., Ltd., with engines to be supplied by Messrs. Richardson, Westgarth & Co., Ltd., of Middlesbrough.

H. E. Moss & Co.—I also understand that this firm have placed an order on the Clyde for two new large cargo and passenger steamers for South America.

T. B. Royden & Co.—I understand on very good authority that Sir Thos. B. Royden & Co. intend to enter the market very shortly for three new large cargo and passenger steamers, one of which will doubtless be placed with either Messrs. Workman, Clark & Co., Ltd., or Sir Raylton Dixon & Co., Ltd.

Elder, Dempster & Co., Ltd.—I learn that these people also have placed an order with Messrs. The Palmer's Shipbuilding Co., Ltd., of Jarrow-on-Tyne, for two new steamers for their coastal service abroad.

Despite the large amount of new tonnage stated above, which has recently been placed, trade generally in this district is about at its worst, and amongst the smaller firms of engineers, with the exception of the two mentioned at the head of these notes, things are exceedingly quiet. There is a large amount of tonnage lying idle in both the Liverpool and Manchester docks, and one has only to notice the great number of unemployed engineers and mechanics along the line of docks to obtain a fairly reliable index to the bad state of the engineering trade in this district.

NORTH-WEST OF ENGLAND.

(*From our Own Correspondent.*)

THERE is practically only progress of work in hand to report from this district with regard to shipbuilding. Fresh work is badly needed. There have not been any important orders booked during the month, and the launching ground is beginning to look very empty. Now that the ice-breaker has been launched there is only the second-class cruiser *Liverpool* building on the stocks. There is, of course, the submarine department, but this is not included. That department is a branch of its own. There are rumours going about that there may be another floating dock or two to build, but no preparations have been made as yet for the laying of them down. There is not a question of doubt as to the capability of Messrs. Vickers' Company in regard to the construction of large high-speed passenger steamers, but the orders do not come this way. This firm has already established its name respecting the building of cross-Channel steamers, but orders for even these are hard to obtain. Competition for this class of work is very keen indeed, and prices have to be at rock bottom to stand any chance. Some day Barrow will probably be famous for its ocean fliers, and the sooner the better, for there is no class of work that finds more employment than the ocean liner. Now that vessels up to 100 ft. beam can be admitted into the docks all difficulties in that direction have been swept away.

Engineering.—There are indications that the engineering side are to be busier in a few months. At present men are being paid off, but before long the departments should be on double shift, at any rate as far as the gun-mounting shops are concerned. At present the *Vanguard's* guns are occupying the pits, or most of them, and these are nearing completion. They are at the time of writing undergoing Admiralty tests. When these are out and are being put on to the *Vanguard* other guns will be taking their places. There are the ten 12-in. guns and mountings to be constructed for the Fairfield-built "Dreadnought," there are the Spanish guns to be commenced upon, and in addition to this there is some Italian work which, it is said, may develop into a big order, and which includes garrison as well as naval guns. Messrs. Vickers have had at one time and another a fair share of work from the Italian Government. Further than this, there are some Japanese orders to deal with that Mr. Douglas Vickers brought back with him from Japan a month or two ago. Other work is in prospect. In regard to the turbines for the three Spanish battleships, these will be constructed in Spain, probably at Ferrol. Only the heavy castings will be made at Barrow.

The "Vanguard."—Both masts and funnels are in position now in the *Vanguard*, and at the time of writing she is about to be put on the outer berth to allow of the Brazilian coming under the big crane to take in machinery and boilers. The *Vanguard* cannot be said to look pretty with her tripod masts and two-sized funnels. First comes a mast, then a

thin funnel, then another mast, then a big funnel. Appearance is not considered now. Utility is the main thing now. There does not appear to be any sign of delay in the completing of this vessel, and according to Mr. M'Kenna's reply in Parliament, she will be delivered up to contract time, which is not the case of the sister ships *Collingwood* and *St. Vincent.*

We have heard the last of the gangway disaster now. The jury who would not sign the inquisition were up before Judge Walton at the Lancaster Assizes and, contrary to expectation, they scored to a certain extent. The coroner had refused to record the opinion of the jury that sufficient care had not been taken in the examination of the gangway before it was put into use. The jury, therefore, refused to sign. The judge of assize suggested that the opinion should appear on the margin. The jury finally agreed to this, so in a way it has been recorded. The coroner has since referred to the inquiry, and is determined in future that adjournments shall be done away with. He does not seem to have been satisfied, for he said that it was evident that when the jury inspected the scene of the accident in the shipyard they must have obtained certain information which did not come out in the inquest. Altogether, the case has been a peculiar one, and it is a good thing that it has finished.

The "Sao Paulo."—The Brazilian "Dreadnought" has been getting along slowly —but then she is not wanted until next July. A certain amount of work has been going on, but this will be more now that she is taking her machinery and boilers on board. In regard to this vessel's machinery it is more than likely that the two sets of engines of a total horse-power of 23,000 will be the last big reciprocating job that will ever go through Messrs. Vickers' works. It is a pity in one sense, for it means less work for the engineers in the future, for the turbine does not find the same amount of employment by any means.

The Ice-Breaker.—On June 18th, the Canadian ice-breaker *Earl Grey* was launched. This vessel is much larger than the *Lady Grey*, which was built at Barrow some time ago and which has proved to be such a success. The *Earl Grey* is a fine model. With her length of 250 ft. she has the abnormal beam of 47 ft. 6 in. Of course, this is necessary, for she requires to have plenty of weight for her work, and in addition, the channel which she will open out in the ice floes of the St. Lawrence rivers and gulf will have to be fairly wide. Her set of reciprocating engines are a very solid job.

Floating Dock.—The Rotterdam tug *Thames* took out, on June 16th, a small floating dock built by Messrs. Vickers to the river Niger. The ultimate destination is Lokoja, which is some distance up the river. The dock is on the Clark and Stansfield's principle. Messrs. Vickers seem to be gaining valuable experience in this class of dock, and it should mean the orders for many more.

The "Dunottar Castle."—The work of alteration and extension to the cabins of the *Dunottar Castle* has been finished, and the vessel left Barrow on Saturday, the 19th of last month, for Liverpool, where she was dry-docked. It has been smart work, and an enormous amount of work has been done in a few weeks. This vessel, before the end of the month, sailed for Norway with a full complement of passengers booked through Dr. Lunn's agency, for which this vessel has been altered. Her masts have been shortened considerably, but otherwise there have been no external alterations.

The secret is out at last. It is a fact that Messrs. Vickers are interesting themselves in airships or aeroplanes, and it has been stated in the local press that a big shed is to be built on piles in the Cavendish Dock, which is of 120 acres in extent. Messrs. Vickers are a remarkable firm. They do not appear to be satisfied with the construction of vessels that sail on the water and with vessels that sail *under* (the submarines), but now they must go in for vessels that will sail *above* the water. What the new vessel or ship is to be is not known at present, but there are rumours going about that it is to be a huge airship that will be as big as a Zeppelin.

The Spanish Work.—The Spanish work has commenced and a number of men have left Barrow to take up important positions at Ferrol. Mr. A. J. Campbell, the late shipyard manager at Barrow, has left to take up the responsible position of director of construction, and he will shortly be joined by Mr. P. Muir, who is expected from Russia in a few weeks. The actual date for commencing work was June 21st.

The case of the *Dunottar Castle* again calls attention to the necessity of a large dry dock at Barrow. For a place like Barrow, possessing as it does one of the finest and most up-to-date shipyards in the world, not to possess a dock capable of taking a big merchant steamer or a battleship seems strange, and sooner or later something will have to be done. It is not so very certain now that it will be a dry dock. It is just possible that Messrs. Vickers may construct a large floating dock and place it in a suitable position in the docks. There seems to be little chance of the expense of a dry dock being gone into. In regard to a floating dock, dredging would be necessary. A depth of over fifty feet would be necessary. Further, one of the things that will come in Barrow will be a floating crane similar to the big crane on the Tyne and at Belfast. A crane like this would be a boon, even considering the fact that Messrs. Vickers possess two 150-ton electric cantilever cranes. With a portable crane more work could be done and the ships could, if necessary, be more distributed than they are at present. It is only a matter of time.

Hæmatites.—The iron and steel trade is not very brisk, although there is a slight improvement in prices. The iron trade is just beginning to revive, and another furnace has been put in blast, but this has been rendered necessary on account of the increased consumption for steel making. There is a better inquiry from the Continent and there have been several small shipments already. Warrants have risen as high as 58s. per ton net cash, sellers and makers are asking about 60s. per ton net f.o.b. for ordinary qualities mixed Bessemer numbers. There is a growing tendency to ask for iron of special qualities of stated analysis. In the case of these the prices increase according to quality. Ferro-manganese and spiegeleison is in better demand. The steel trade shows weakness and the amount of work in hand is not heavy. There is still nothing doing in the shipbuilding material departments, and the outlook is bad.

Shipping.—There is a decided improvement in shipping, and this year's aggregate shipments of iron and steel, as compared with last year's, show an increase of about 50,000 tons. The shipping at Barrow has been better and several large cargoes have been despatched (of rails) to New Zealand, India and South Africa. Ore has been imported in larger quantities. Freights still keep low.

BELFAST.

(*From our Own Correspondent.*)

There is at present no tremendous activity in the shipbuilding trade of the port, nevertheless the volume of work in hand is considerable. Two or three important orders have been booked, and there is a prospect of further contracts being fixed in the near future.

Messrs. Harland & Wolff have completed and sent to sea the Canadian White Star liner *Megantic*, sister ship to the *Laurentic*, which recently inaugurated the Company's Canadian service, except that whereas the former is propelled by two sets of reciprocating engines, the latter is fitted with a combination of turbine and reciprocating machinery. The short time that the *Laurentic* has been in commission has been long enough to provide her builders with sufficient data in connection with the combination machinery. That they have pinned their faith to the system is evinced by the fact that it is being adopted in the case of the two big boats, *Titanic* and *Olympic*. Early in the month the new Bibby liner *Leicestershire* was launched from the south end of the Queen's Island. Her principal dimensions are: Length, 490 ft.; beam, 54 ft. Early in July a fine new vessel named *Meltonian* for the Leyland line will be launched from the south end of Messrs. Harland & Wolff's yard.

Messrs. Workman, Clark & Co. have a considerable amount of work in hand, including a steamer for the Harrison Line, and one for the Shaw, Savile and Albion Company. They are also reported to have booked an order for several vessels for the Italia Company. They have made good progress with the fitting out of the big Orient liner, and she will shortly be ready for sea. Her sister ship is approaching the launching stage.

Messrs. MacColl & Co. have in hand for repairs and overhaul the suction dredger *Fag-an-Bealach*, belonging to the Department of Agriculture and Technical Instruction (Fisheries Branch).

CORRESPONDENCE.

We do not hold ourselves responsible for the opinions expressed by our correspondents.

The Schmidt Superheater.

To the Editor of The Marine Engineer and Naval Architect.

Dear Sir,—We have been interested in reading the letter on this subject which appeared in your May issue.

A. W. is quite right in stating that it would be hard to convince sea-going engineers of the losses due to condensation. These losses are not due to anything being wrong in the working of the engines and boilers, the error is made in using steam which from the moment of its entrance into the high-pressure cylinder contains a quantity of moisture which goes on increasing during expansion in the cylinders until the point of release in the low-pressure cylinder. In the case of triple-expansion engines 20 per cent. and in the case of slow-running paddle engines nearly 50 per cent. of the total amount of the steam admitted into the high-pressure cylinders leaves the low-pressure cylinders in the form of water. This has been proved from experience.

With regard to the economy in coal consumption the figures stated are taken from actual practice and are not a theoretical gain.

The Oldenburg Portuguese Steamship Company have seven steamers using superheated steam on the Schmidt System, and a report received from this company states that all of their vessels using superheated steam show an economy of 15 per cent., as compared with similar vessels using saturated steam, or with the same vessel before being fitted with superheaters. They further state that "we have not had any disturbance in the service owing to the application of superheated steam, either with the engines, boilers, or superheaters, and we shall, therefore, adopt superheating in future steamers in order to utilize the advantages connected therewith."

The Argo Line has up to now fitted five of their steamers with Schmidt's superheaters, and with triple-expansion engines the average economy realized in actual practice is 20 per cent.

Many more instances might be quoted in which the consumption of coal has been reduced by the adoption of superheated steam by as much as 28 per cent.

Up to this date 142 vessels are in regular service using superheated steam on the Schmidt System, and forty vessels are now in course of construction in which Schmidt superheaters will be installed, therefore the best answer which could be made to anyone in doubt is to go and see one of these vessels and verify the facts for himself.

A. W. is under the impression that the figures regarding the economy in coal consumption in the case of the steamer *F. Haniel I.*, have been measured by simply putting the superheater out of use. This is not so. In the case of this ship the average figures on similar voyages have been taken before fitting the superheater and after fitting the superheater, so that the test made was as fair as it was possible to make.

Regarding the reduction of firemen, A. W. states that it would not be advisable to reduce the number of men employed in the stokehold, because of the fact that the engineering staff are already hampered for want of assistance for cleaning and repairs: this, however, has nothing at all to do with the question, except in so far that in all steamers fitted with Schmidt superheaters the work which the firemen are called upon to do has been considerably reduced, and they have, therefore, more time for other work than that of firing the boilers and getting up ashes, for instance, instead of handling thirty tons of coal per day only twenty-four tons requires to be handled.

It may interest A. W. to know that in several cases on the Continent, where the number of firemen is fixed by law, they allow a reduction in the number of men in the case of vessels using superheated steam.

With regard to the cost of maintenance it has been proved over and over again that there are no expenses incurred in upkeep to militate the gain obtained by the economy of coal.

On the question of cleaning, in vessels using superheated steam the tubes are cleaned in much less time than would generally be used in hand brushing and in vessels using Howden's Forced Draught, the saving of time in cleaning tubes is still more pronounced.

In the case of the steamer *Schwan*, now running into London, A. W. may observe for himself a two-furnace boiler entirely freed from dust, soot and ashes in fifteen minutes; before fitting the superheater on this vessel the time occupied in taking out and replacing the retarders and brushing the tubes took two men half a day, as compared with one man now able to do the work in half an hour.

Lubrication is effected very simply, and in no case have we experienced any trouble with the boilers due to the presence of oil.

Generally speaking, the use of superheated steam instead of saturated steam will obtain for the shipowner such an enormous reduction in the total cost of coal that it is due to superintendent-engineers to make up their minds not to be deterred by any small difficulties which may attend the use of superheated steam, so that they may be enabled to obtain for the owners of vessels under their care the permanent benefits accruing by its use.—We are, yours faithfully, for Schmidt's Superheating Co., Ltd., London Technical Office,

4th June [illegible]. A. J. W[illegible]

The Harker Fire-Extinguishing Apparatus.

To the Editor of The Marine Engineer and Naval Architect.

Dear Sir,—In thanking you for the notice of the Harker fire-extinguishing apparatus which appeared in your issue of June, we trust you will allow us a little space in your next issue to reply to one or two of the points raised in the article.

In the first place, with regard to the installation of our machine on the s.s. *Fiona*, we would remark that full particulars of the tests which were carried out upon her under working conditions were included in a pamphlet which was sent to all those invited to witness the demonstrations in Messrs. Green's yard at Blackwall, which will show that the tests were in every way satisfactory.

With regard to your remarks on Mr Carver's process, we have to thank you for directing our attention to Mr. Canning's paper on "Fires on Shipboard," the existence of which we were not previously aware of, although after giving their public trials in Sydney, Dr. Harker and Captain Grainger became aware of Carver's apparatus, and have since found out that demonstrations of it had been given in Liverpool some twenty years ago.

We do not know the capacity of the Carver apparatus which was fitted to the Liverpool salvage steamer, nor are we aware of the conditions under which it was actually tried in practice, and until we can obtain this information, it is impossible for us to assign a reason for its apparent failure. One thing certain is that if the apparatus had been sufficiently powerful to surround the burning mass in the hold of any ship to which it was applied, with flue gas, and had the gas been applied for a sufficiently long time to cool down the mass in the hold, the fire would have been extinguished.

It is possible that twenty years ago the amount of air used in consuming coal in boilers was considerably in excess of that employed at the present time, and that consequently the flue gases had not so low a content in oxygen as we find under average working conditions at the present day. We hardly think, however, that this would be the reason of the failure of Carver's apparatus, since at Messrs. Green's yard we were able to show that fires could be completely extinguished by our plant with flue gas containing only 7 to 8 per cent. of CO_2. In the absence of more complete knowledge we should be inclined to attribute the disuse of Carver's apparatus, not to the fact that flue gas at that time was of such a composition as not to be fire extinctive, but to the fact that it would be ushered into the burning hold in company with a very large proportion of live steam, which, of course, would damage to a considerable extent any cargo. In addition to this, the Carver apparatus dealt with a much smaller volume of gas than ours, which we have designed to force not less than 1500 cubic feet per minute into the hold. Furthermore, the shipping world twenty years ago was not prepared to recognise the value of gas as a fire extinctive medium.

substitution of a fan mechanically driven for a steam jet, but this difference is of the greatest importance for several reasons. To begin with, a steam jet is disadvantageous for the reason that it is not an economical means of forcing gas, and that much more steam is required to force the same volume of gas than when a mechanically driven fan is employed, especially if it is required to force the gas under considerable pressure. A steam jet is also more likely to get out of order than a turbine, especially where it might be lying unused for several months. In the Harker machine, which is used for disinfecting purposes also, it would be altogether inadmissible.

The principal objection to the use of a steam jet, however, is that it necessitates the introduction of very large quantities of steam into the holds, which might cause serious damage to the cargo and ship's fittings. This damage is altogether avoided in the Harker apparatus by the use of a mechanically driven fan.

We may say that a Committee of the New South Wales Parliament has recently recommended that the salvage steamer in Sydney Harbour should be fitted with the same apparatus as was recently exhibited at Blackwall, but for salvage steamers, in our opinion, the machine supplied should be capable of forcing up to 3000 cubic feet of fire-extinctive gas per minute into the burning hold. We are not aware of any plant which can compare with our own for forcing such large quantities of fire-extinctive gas.

Mr. Canning's article is a most interesting one, giving as it does a *resumé* of all the proposed methods of fire extinction, and we should very much like an opportunity of replying to some of the points he raises, but we fear that space will not permit it.

The main point is this, as was shown in Dr. Harker's paper, which has just been read by him on the subject before the seventh International Congress of Applied Chemistry, that the experiments of Prof. Clowes have clearly and effectively shown that in fire extinction by gas, the essential feature is the reduction of the ratio of oxygen to other non-combustible gases present and that it is not the gas *per se* whether carbonic acid gas, nitrogen or sulphur dioxide which extinguishes the fire; consequently, in considering any process of fire extinction by means of gas, the question to be asked is: which process can most quickly and most economically reduce the ratio of oxygen to the other gases present below the point at which fire can live? Considered from this point of view, the use of flue gas, a waste product, stands eminent, and this is the reason that we have never wavered in our belief that the process must come into general use.

Other gases, such as CO_2 or SO_2, have to be stored or manufactured on board the ship and only limited supplies can be carried, while with flue gas an inexhaustible supply is to hand, and effectively to extinguish a fire by means of gas, large supplies are a necessity to complete the cooling.

One of the most important uses of the flue gas process will undoubtedly be in the prevention of fire in cargoes liable to spontaneous combustion. Such cargoes can be surrounded with an atmosphere deprived of oxygen from the beginning of the voyage, and as it is only by the slow absorption of oxygen that such fires start, it will be impossible for any fire to break out at all. Fiery coal and other such cargoes will be carried quite safely by surrounding them with the gas. No damper is necessary, and this was proved at Messrs. Green's yard by showing that the gas in the chimney to which the machine was connected had same composition when machine was working and when not. The chimney was connected to one boiler having a grate area of only 20 square feet. In the case of a donkey boiler, such as that on a sailing ship, a damper is necessary, as in this case the whole of the flue gas is made use of.

We do not anticipate that there will be any trouble through moisture getting into the holds along with the gases, as in the cooler the gas will pass through in contact with the water, and the moisture that is evaporated at the end where the hot gas meets the water will be condensed at the end where the cool gas is leaving the apparatus.

With regard to the question of price, we may say that we have kept well in view the advantages of a low first cost, and we hope to put the apparatus on the market at a very reasonable figure. We have come to an agreement with Messrs. Greenwood & Batley, of Leeds, for the manufacture of the turbine, and Messrs. The Thermotank Ventilating Company for the fitting up of the plant. We are confident that the workmanship turned out by these firms will be of the very highest class.—For the Harker Fire Extinguisher and Fumigator Co.,

The main difference, however, between the Harker apparatus and that of Carver's is, as you have pointed out, the

ALEX. CRAIG,
18th June, 1909. Representative for England.

The Carborundum Company.—We have received from the Carborundum Company, of 29, Clifton Street, Finsbury Square, London, E.C., an illustrated and descriptive catalogue of the various types and shapes of grinding wheels which are manufactured and sold by them. The catalogue commences with a clear description of physical characteristics of the material, which is a manufactured abrasive and it goes on to describe the method of production of such material from coke and sand. Illustrations are given of the electric furnaces used in the manufacture, and the general appearance of the carborundum furnace after operation is illustrated showing the material as it appears therein, in the form of large lumps of crystalline formation. After its removal from the furnace it is crushed and graded out into various sizes and is made up into grinding wheels to suit the many purposes to which it is applicable. The main characteristics of the material are hardness, sharpness, fusibility and insolubility. The illustrations not only give the various shapes, but also the dimensions both as regards operative surface and for mounting any particular wheel upon its rotating support. In this direction the catalogue is particularly useful to those using grinding machinery, as they not only have a ready means for selecting a particular shape, but also certainty of knowing exactly how to provide for carrying the wheel when delivered to them, thus avoiding loss of time. A useful telegraphic code is included at the end of the catalogue, together with an index of numbers relative to special shapes of wheels, thus giving splendid facility for ordering by telegraph at the lowest possible cost.

REVIEWS.

The Screw Propeller and other Competing Instruments for Marine Propulsion. By A. E. Seaton, M.Inst.C.E., M.I.Mech.E., M. Council N.A. 12s. 6d. net. London: Charles Griffin & Co., Ltd.

THE author of that standard text book, "A Manual of Marine Engineering," has produced a most interesting book on marine propulsion, which deals mainly with the screw propeller, whilst the other propulsive devices are dealt with sufficiently to enable comparisons to be drawn and appreciated. The book commences with an interesting history of marine propulsions which, on the face of it, seems to be very exhaustive and complete. Starting with the use of paddle wheels by the Consul App Claudius in B.C. 264, in boats used to transport his troops to Sicily, the author takes one by chronological steps dating from A.D. 1472 to 1875. This historical record is rendered more interesting and valuable by the fact that it is illustrated by a series of diagrams which show how the pendulum of inventive effort has swung first one way and then another. This aspect of the subject, as treated by the author, has a distinct value, apart from the mathematical side of the subject, dealt with in the succeeding chapters. The resistance of ships is dealt with concisely and clearly, and the mathematics involved are of a fairly simple character. The question of apparent real positive and negative slip, also the production and effect of cavitation is simply and comprehensively explained in a way as to be of great assistance to the student in mastering the problems. Paddle wheels, hydraulic propulsion, each have a special chapter devoted to them, while the remainder of the book, *viz.*, eleven chapters, is devoted to the screw propellor as the most common propelling device. There is a fine frontispiece of the s.s. *Lusitania* on the stocks ready for launching, also six plates and sixty-five other illustrations, while there are no less than sixty tables containing information of the most useful character. It is not reasonable to expect that an author can include in his compilation any of that valuable information on propeller research which is in the hands of the great firms of shipbuilders and engineers, as such information is of a private nature, and forms part of the confidential

knowledge which is a valuable asset of the manufacturers. One naturally would have desired to have information as to the performances of some of our latest turbine steamers so that comparisons might have been readily drawn between the old and new practice, but this would be impossible, as has already been pointed out. Of course, much of the matter of the book has been dealt with in the proceedings of our scientific institutions, but we think that the author has filled a genuine gap in the literature of the subject by producing this concise and comprehensive treatise.

Slide Valve Motion for Marine Engineers. Peter Youngson. 5s. net. James Munro, Glasgow.

THIS work has been specially written for marine engineers. The slide valve with its gear is the pulse of the engine, and is of paramount importance in providing economy in fuel combined with smoothness in running. In accordance with this principle the valve is set out in every position to show its action intelligibly to every engineer. A large scale of the same valve is set out with both the inside and outside lap shown. Then the eccentric and the method of setting out the position of the valve to suit the outside lap is shown and the question of lead is fully ascertained and set out. The angularity of the connecting rod is discussed, with its effect upon the piston, and eventually upon the movement of the valve relatively to the piston. Then comes the question of piston valves, which it is stated is the best arrangement, as these valves are in equilibrium, and the friction is very little. In some cases the steam is admitted to these piston valves either over the ends or in the centre, but in all cases the valve is in equilibrium. In the case of the double-ported slide valve the relief upon the valve is effected with a relief ring making a steam-tight joint at the back of the valve, and a balance piston must be used. Myers' expansion valve is then discussed, with drawings showing the valve which cuts off steam as it works over the protected under ports of the valve beneath it. It is pointed out how the cutting off of steam is effected by the difference of the positions of the two parts of the valve which are connected by right and left-handed screws upon its own valve rod. Then we come to slide valve motions, which are excellently illustrated, in which the position of the valve motion is shown and described in certain tables. After this are diagrams very well set out, from which the distribution points may be ascertained, and there are diagrams from which the travel of the valve may be set out in a simple manner. A chapter upon indicator diagrams is given, the principle of the diagrams being set out and irregularities explained as showing a similar irregularity in the set-out of the valves and crossed cards from the same engine ; ordinary diagrams are also shown. The author has written an excellent chapter on miscellaneous gears, which include Weir's feed pump valve gear and Worthington pump valve gear, both being shown with various illustrations giving details of the valves and the general arrangement of the engine and pump. The author completes his task by setting out 103 questions obtained from the Board of Trade examinations, to which proper answers are given, thus making the whole work a most valuable one to the marine engineer.

Welding and Cutting Metals by aid of Gases or Electricity. Dr. L. A. Grothe. 10s. 6d. net. Archibald Constable and Co., Ltd., London.

THE volume under review we consider to be an excellent work. The type is clear, easily readable, and the illustrations numerous ; but it is as an exemplification of the methods of welding by various gases and by electricity, and as a record of these processes, that will make it most useful to our engineers. Recent investigation personally made by the author in various countries has proved that welding by combustible gases or by electricity is being used to a far greater extent than is generally known. The amount of combustible gases consumed in England, France and Germany is set out in Chapter xi., and it is to be noticed that France uses twice and Germany nearly three times as much as England. A general description is given of the various and distinct methods for the generation of the various combustible gases, their suitability and selection for various operations, together with a collection of results and tests obtained. This should be very useful information, being an accumulaton of practical experience which will serve to illustrate the proceedings of the new methods of welding, as this still forms part of a new industry. In order to ensure that safety which is required in some branches of industry, it is required to find means of testing a bad weld, which may be sheltered under a smooth and perfect surface, and might be caused by the use of gases of inferior purity or by unskilled labour. Amongst the gases of which the preparation is given are acetylene from carbide of calcium, Blau gas, which has a higher calorific value than acetylene, hydrogen and oxygen, and water gas ; the application of these gases with electricity as applied to the welding of bars or sheets is well treated. The use of Thermit is given, with illustrations of materials, prepared in the proper manner for welding with this process, and striking examples showing the saving of time by the Thermit process of welding are included. Electric welding is well set out with illustrations of special machines for the treatment of chains and buckles, door-hinges and for flat hoops, with machines for welding pulley spokes to the rim and the hub. Hydrogen welding is compared with acetylene welding, showing the much smaller cost of the hydrogen plant and better facility of installation, less liability to disaster for want of the mechanic being a practised man, and there being no danger from poisoning by hydrogen as compared with acetylene. Welding as applied to marine boilers is a most excellent chapter, the illustrations showing exactly the nature of the repairs executed together with an explanatory detail of the job. These have been done chiefly by electricity, though oxy-acetylene welding is not forgotten. Following is a chapter upon accidents resulting from some of these gases, which is most interesting reading, and the two final chapters deal with legislation relating to calcic carbide and acetylene, and useful addenda, which give most suitable data excellently adapted to the readers of this volume.

The Power Handbooks (Steam Turbines). Herbert E. Collins. 4s. 6d. The Hill Publishing Company, of New York and London.

THIS volume forms the ninth of the above series of " Power handbooks," and is a compact manual for those engineers who feel the need of becoming better acquainted with steam turbines. There are practically only a few standard types of turbines included in this volume, but the description given is essentially for the man who actually instals and handles these machines in practice. It tells the man on the job about the details of the turbine in plain language, and how to handle those details. The operating engineer does not care why the moving buckets are made of a certain curvature, but he does care about the distance between the moving bucket and the stationary one, and he wants to know how to measure that distance, how to alter the clearance, if necessary, to prevent rubbing. He does not care anything about the area of the step-bearing, but he does want to know the way to get at the bearing to take it down and to put it up again. There is at present a complete lack of literature along this line and the present volume is exactly what the men in charge of such steam turbines want to explain to them the details of the steam turbines and the tests that may have to be taken. We find that the steam turbines given are the Curtis steam turbine, the Allis Chalmers turbine, which is nearly the same as the well-known Parsons type, and the Westinghouse-Parsons turbine. Of this first type a builder's foundation plan is given with full details of such foundation, and of the step top blocks with their respective method of engagement, and considerable information is given as to the method of holding up the upper shaft so as to relieve the under top step and blocks. The question of clearance between the revolving and stationary parts is well set out and the proper tools are described by which this clearance may be tested and measured. The governors, including the safety stop and the mechanical valve gear, are very well explained, and information is given as to the setting of the valves of a Curtis turbine. In the horizontal turbines following there is not so much information as to the foundations, but the details of how to start up and what to watch during operation are fairly given. With regard to the Westinghouse-Parsons patent the blading of the rotor of these turbines is given most clearly, and the details of how to start up and how to shut down these turbines is most clearly given. A final chapter is given to auxiliaries for steam turbines, in which the features demanding attention are well set out together with the special auxiliaries necessary for testing.

LAUNCHES AND TRIAL TRIPS.

LAUNCHES—English.

Sun II.—On April 24th, a handsomely modelled powerful steel screw sea-going tug, *Sun II.*, built to the order of Mr. W. H. J. Alexander, of London, was launched from the yard of Messrs. Earle's Shipbuilding & Engineering Co., Ltd., Hull. The vessel is one of two that Messrs. Earle's Co. are building for the same owner, and is intended for ocean work and for attendance upon the largest steamers afloat, being designed especially for that purpose, and also for salvage work. The dimensions of the vessel are: Length, 100 ft.; breadth, 25 ft. 6 in.; depth, 12 ft.; and has been built under Lloyd's survey for 100A1 class, also Board of Trade requirements, and is provided with two large towing hooks, one at the after end of the boiler casing and the other at the after end of engine casing; there is a large deck-house at the fore end of the boiler casing, comprising galley, etc. The captain and officers are berthed in the forward cabin and the crew in the after cabin. She will be fitted with a powerful steam windlass and hand-steering gear. The machinery will consist of a set of triple-expansion engines, having cylinders 15 in., 24 in., 40 in. by 27 in. stroke, steam being supplied by a large single-ended cylindrical boiler working at a pressure of 180 lbs. per square inch.

Marreca and **Mutum.**—On April 29th, were successfully launched from the yard of Messrs. Edward Finch & Co., Ltd., Chepstow, two steel towing lighters, *Marreca* and *Mutum*, of the following dimensions: Length, 100 ft.; breadth, 20 ft.; depth, 7 ft.; built to the order of the Amazon Steam Navigation Co., Ltd., London, under the supervision of Messrs. James Pollock, Sons & Co., Ltd. The lighters, after taking in coal at Cardiff, for ballast, will be towed by a "Booth" line steamer to the river Amazon, where they will be used for the transport of rice in bulk. The hatchways are fitted with galvanised arched plate covers, running on rollers, which form a waterproof covering for the perishable cargo. The lighters have been rigged for sailing, and their outfit and finish are equal to those for large sea-going vessels. These are similar lighters to the *Papagaio* and *Periquito*, launched on August 29th, 1908, for the same firm.

Keyport.—On May 1st, there was launched from the Neptune Works of Messrs. Swan, Hunter & Wigham Richardson, Ltd., a steel screw steamer called *Keyport*, which is intended for the Canadian Lake trade. The steamer is 250 ft. in length by $42\frac{1}{2}$ ft. beam. She is being built to the rules of the British Corporation, for the B.S. ✠ class, for service on the Great Lakes and river St. Lawrence. The engines and boilers are being constructed by the North-Eastern Marine Engineering Co., Ltd., at their Wallsend Works.

Vollrath Tham.—In the first week of May, an ore-carrying steamer, named *Vollrath Tham*, was launched by Messrs. R. & W. Hawthorn, Leslie & Co., Ltd., Newcastle-on-Tyne. The *Vollrath Tham* is being built to the order of the Rederiaktiebolaget Lulea-Ofoten, of Stockholm, and the construction of the vessel includes a patent system of ore pockets, with other details designed to make her specially suitable for the Swedish ore trade. She is 390 ft. over all, 376 ft. by 56 ft. 6 in. by 33 ft. 6 in., and is built to take the highest class of the British Corporation. The vessel will carry a deadweight of 8,000 tons. A special electric generating plant is installed to supply energy to ten powerful electric cranes of special type, placed at the ore pocket discharge compartments. The engines are of the triple-expansion type, placed aft, and are being constructed by the North-Eastern Marine Engineering Co., Ltd., of Wallsend. They will have cylinders $24\frac{1}{2}$ in., 40 in., 66 in. by 45 in. stroke, the steam being supplied by three powerful boilers, working at a pressure of 180 lbs., and will drive the vessel at nine-and-a-half knots [illegible]

Bucket and Suction Dredger.—On May 4th, Messrs. Earle's Shipbuilding & Engineering Co., Ltd., Hull, launched from their yard, to the order of Mr. Joseph Constant, of London, acting on behalf of the Tilbury Contracting and Dredging Co., Ltd., a large and powerful steel bucket and suction dredger. The vessel has been built to the highest class at Lloyd's, and is of the following dimensions: Length, 174 ft.; breadth, 32 ft.; depth moulded, 14 ft. The machinery consists of twin-screw engines, having cylinders 13 in., $20\frac{1}{2}$ in., 33 in. by 18 in. stroke, arranged for propelling the vessel and for driving the suction pumps and the dredging buckets. Steam is supplied by two large single-ended boilers, at a working pressure of 180 lbs. per square inch. A separate engine is provided for driving cutting gear, having cylinders $13\frac{1}{2}$ in., 19 in. by 18 in. stroke. The dredging machinery will be supplied by Messrs. Smit's Scheepswerven, Kinderdijk, Holland. The vessel will be complete in every way as an up-to-date bucket and suction dredger, and will be capable of steaming to any part of the world.

Asiana.—On May 5th, Messrs. Irvine's Shipbuilding and Dry Docks Co., Ltd., West Hartlepool, launched from their Middleton Shipyard, the handsome steel-screw steamer *Asiana*, built for the Furness Line. She is of the following dimensions: 336 ft. by 47 ft. by 24 ft. 10 in., having single deck, poop, bridge, and topgallant forecastle, and has been built to Lloyd's highest class. A double bottom is fitted throughout on the cellular principle, and the fore and after peak tanks are arranged as trimming tanks. She is constructed with deep frames and longitudinal stringers, giving clear holds for the stowage of bulky cargoes. Five water-tight bulkheads divide the vessel into six water-tight compartments, and wood grain divisions are fitted in the holds. She also has extra large cargo hatches, five steam winches, supplied with steam from a vertical multitubular donkey boiler, and is replete with all the latest improvements for rapid loading and discharging. A powerful quick-warping steam windlass is fitted forward for working the cables and steam-steering gear is fitted amidships with hand screw gear aft. The sanitary, ventilating and lighting arrangements have received special attention, and have been effected on the most improved lines. Triple-expansion engines are being supplied and fitted by Messrs. Richardsons, Westgarth & Co., Ltd., Hartlepool, having cylinders $23\frac{1}{2}$ in., 33 in., 64 in. by 42 in. stroke, with two large single-ended boilers working at a pressure of 180 lbs. per square inch. The ceremony of christening the vessel *Asiana* was gracefully performed by Lady Furness.

Webburn.—On May 4th, Messrs. W. Harkess & Son, Ltd., launched from their shipyard at Middlesbrough, a steel screw steamer of 1,100 tons d.w., which they have built to the order of Messrs. Whiteway & Ball, of Torquay, for their coal and timber trades. The dimensions of the vessel are 190 ft. by 30 ft. by 15 ft. moulded. She is built in excess of Lloyd's 100A1 class, and to full specifications, and will have engines supplied by Messrs. Richardsons, Westgarth & Co., Ltd., of Middlesbrough, capable of driving her a speed of ten knots loaded. A Cochran (Annan) donkey boiler with patent seamless furnace has been supplied and fitted. On leaving the ways she was named *Webburn* by Miss Mary Harkess, of Stokesley. This is the third sister vessel these builders have recently supplied to Messrs. Whiteway & Ball.

Ambiorix.—On May 4th, Messrs. Wm. Pickersgill & Sons, Ltd., launched from their shipbuilding yard at Southwick, Sunderland, a finely modelled screw steamer, built to the order of the Antwerpsche-Zeevart-Maatchappij Co., Ltd. (Messrs. J. D'Haene & Co.), Antwerp. Her principal dimensions are: Length, 259 ft.; breadth, 38 ft.; depth, 19 ft. 6 in.; and she is built under special survey to take Germanischer Lloyd's highest class. The vessel is built on the deep bulb angle frame principle, and is fitted with cellular bottom, whilst the after peak is also arranged for water ballast, and the fore end strength is considerably increased to enable her to frequent ice-bound ports. Accommodation for captain and officers, together with a tastefully finished saloon, is fitted in deck-house on bridge deck, whilst the engineers are also accommodated in a deck house at side of casing on bridge, the crew being berthed in the top-gallant forecastle. Four large hatches are arranged with winches and derricks for lifting heavy weights. The pillars at sides of hatches have been dispensed with, so as to leave large clear holds. She is also fitted with steam windlass and steam-steering gear, which is fitted in the engine casing with controlling shafting to wheel on bridge. She will be rigged as a fore and aft schooner, with steel lowermasts and wood topmasts. The machinery is being supplied by Messrs. MacColl & Pollock, Ltd., of Sunderland, being of the triple-expansion type, having cylinders 18 in., 30 in., 49 in. by 33 in. stroke, steam for which will be supplied from two large steel boilers with a working pressure of 180 lbs.

Wheatfield.—On May 5th, a steel screw steamer, built to the order of Messrs. Spillers & Bakers, Ltd., was launched by Messrs. Jos. T. Eltringham & Co., from their South Shields yard. The vessel was designed under the supervision of Capt. Edward Hall and Mr. A. E. Mills, of Cardiff, and is of the following dimensions: Length overall, 167 ft. 6 in.; breadth, 26 ft. 6 in.; depth moulded, 11 ft. 6 in. She is fitted with high-pressure compound engines by Mr. G. T. Grey, of South Shields, with cylinders 20 in. and 42 in. by 27 in. stroke, and an extra large boiler by Messrs. Eltringham. The steamer is constructed to Lloyd's highest class and Board of Trade requirements for the special carriage of grain and flour to owner's various English and Irish depots. She has water ballast in the cellular double bottom and peaks, and is fitted with electric light throughout; also a Cochran (Annan) donkey boiler with patent seamless furnace, powerful steam winches, steam windlass, capstan and steering gear, and all modern appliances.

Broomhill.—On May 6th, Messrs. Irvine's Shipbuilding and Dry Docks Co., Ltd., launched from the Harbour Dockyard, West Hartlepool, the handsome steel screw steamer *Broomhill*, built to the order of Messrs. The Broomhill Collieries, Ltd., Newcastle-on-Tyne. This vessel is an up-to-date self-trimming collier, having extremely large hatchways and equipment for rapid loading and discharging. The dimensions of the vessel are 260 ft. by 36 ft. by 17 ft., and is fitted with poop, raised quarter deck, bridge and forecastle, and is built to Lloyd's 100A1 class. A cellular double bottom is fitted throughout, with extra large fore and after peak tanks, thereby considerably immersing the propeller and thus enabling the vessel to make passages in ballast condition, without reducing her steaming qualities. The pumping arrangements have been so carried out that the whole of the water ballast can be pumped out in two-and-a-half hours, which enables the vessel to make the port in a full ballast condition, whilst at the same time she is able to commence loading immediately. She is constructed with bulb angle frames and longitudinal stringers, and is subdivided to give four clear holds. A powerful quick-warping steam windlass is fitted forward for working the cables, and steam-steering gear is fitted amidships, with hand screw gear aft. A Cochran (Annan) donkey boiler with patent seamless furnace has been supplied and fitted. Triple-expansion engines are being supplied and fitted by Messrs. Richardsons, Westgarth & Co., Ltd., Hartlepool, having cylinders 18½ in., 30 in. and 50 in. by 36 in. stroke, with two boilers 180 lbs. pressure.

Berbice.—On May 6th, the fine new inter-colonial mail steamer *Berbice* was launched for the Royal Mail Steam Packet Company, by Messrs. Harland & Wolff. Her dimensions are:—Length 313 ft.; beam, 38 ft. 3 in.; gross register about 2,500 tons. The *Berbice*, the first of two new vessels, is provided with accommodation of a superior character for a large number of first and second saloon passengers, as well as for deck passengers. The state-rooms are large and airy, and are provided with electric fans and other modern appliances to enhance comfort. The first-class dining saloon is on the main deck, and extends the whole width of the ship. The side lights are of large diameter and arranged in pairs, thus ensuring ample ventilation. The bridge deck is entirely devoted to first saloon passengers, the lounge being at the forward end, and a verandah at the after end, the latter serving as a semi-enclosed smoking-room, cool and comfortable in every way. The *Berbice* will be fitted with electric light throughout, and will also be provided with refrigerating machinery and insulated chambers. The vessel has two sets of Messrs. Harland & Wolff's balanced quadruple type of engines. The double set of engines for the twin screws constitutes an additional element of safety. She is provided with hydraulic cranes for the prompt handling of cargo through large hatches. She is appointed to leave Southampton on July 21st, to take up her position in the inter-colonial mail service of the West Indies.

May Scott.—On May 8th, the Blyth Shipbuilding & Dry Docks Co., Ltd., launched from their Shipbuilding and Graving Dock Works, the fine steel screw steamer *May Scott*, built to the order of Messrs. John O. Scott & Co., Newcastle-upon-Tyne. This vessel, which measures 255 ft. in length, with a beam of 36 ft. 9 in., has been constructed under Lloyd's special survey to class 100A1. She is of the raised quarter deck type, having long bridge and top-gallant forecastle. The accommodation for captain, engineers and officers is provided in bridge, whilst crew will be berthed in top-gallant forecastle. The *May Scott* is specially adapted for the coal, ore and timber trade, having extra large self-trimming hatches and clear holds together with the best and latest design of deck machinery for the quick and economical working of the cargo. Triple-expansion engines of good power will be supplied by Messrs. The North-Eastern Marine Engineering Co., Ltd., of Wallsend. A Cochran (Annan) donkey boiler with patent seamless furnace has been supplied and fitted. The hull and machinery have been constructed under the supervision of Mr. Norman Burnett, of Newcastle.

Pelican.—On May 18th, Messrs. Wm. Pickersgill & Sons, Ltd., launched from their shipbuilding yard at Southwick, Sunderland, a finely modelled screw steamer, built to the order of Messrs. The Ogmore Steamship (1899) Co., Ltd., Cardiff. Her principal dimensions are: Length, 296 ft.; breadth, 43 ft. 3 in.; depth, 21 ft.; and she is built under special survey to take Lloyd's 100A1 class. The vessel is built on the deep bulb angle frame principle, and is fitted with cellular bottom, whilst a very large after peak is also arranged for water ballast. Accommodation for captain and officers, together with a tastefully finished saloon, is fitted in deck-house on bridge deck, whilst the engineers are also accommodated in a deck-house at the side of casing on bridge, the crew being berthed in the poop aft. Four extra large hatches are arranged with winches and derricks for lifting heavy weights. The pillars at sides of hatches have been dispensed with, so as to leave large clear holds. The machinery is being supplied by Messrs. Geo. Clark, Ltd., of Sunderland, being of the triple-expansion type, having cylinders 21 in., 35 in., 58 in. by 39 in. stroke, steam for which will be supplied from two large steel boilers with a working pressure of 180 lbs.

Inland.—On May 20th, Messrs. Wm. Doxford & Sons, Ltd., launched from their yard at Pallion the s.s. *Inland*, to the order of the Angfartygsaktielaboget Tirfing (Axel Broström & Son), Gothenburg. The vessel is the sixth turret steamer built for the firm by Messrs. Doxford & Sons. The dimensions are:—Length, 292 ft.; breadth, 43½ ft., and moulded depth, 21 ft., and the deadweight carried is 3700 tons on a light draught. Engines, 22½ in., 37 in., 60 in. with 39 in. stroke, and two boilers 15 ft. 3 in. by 10 ft. 6 in., have also been supplied by Messrs. Doxford. The classification is with Bureau Veritas.

Caterino.—On May 20th, Messrs. William Gray & Co., Ltd., launched the handsome steel screw steamer *Caterino*, which they have built for Messrs. Furness, Withy & Co., Ltd., West Hartlepool. She is a sister vessel to the *Rossano*, recently launched for the same firm, and will take the highest class in the British Corporation Register, her dimensions being:—Length, 358 ft.; breadth, 50 ft. 0 in., and depth 25 ft. 6 in., with long bridge, poop and topgallant forecastle. The hull is built on the deep bulb-angle frame system with clear holds, cellular double bottom all fore and aft, and large after peak ballast tank, seven steam winches, double derricks, steam-steering gear amidships, hand-screw gear aft, patent direct steam windlass, extra large horizontal multitubular donkey boiler, shifting boards throughout, stockless anchors, telescopic masts with fore and aft rig, and all requirements for a first-class cargo steamer. Triple-expansion engines are being supplied by the Central Marine Engine Works of the builders having cylinders 25 in., 40 in., 65 in. diameter with a piston stroke of 42 in., and two large steel boilers for a working pressure of 180 lbs. per square in.

Relillio.—On May 20th, Messrs. Robert Thompson and Sons, Ltd., launched from their Southwick Yard a finely modelled steel screw steamer, built to the order of Messrs. the Orders and Handford Steamship Co., Ltd., of Newport, Mon., this being the fourth vessel they have built for the same owners. She will take the highest class in Lloyd's, and is constructed on the deep frame principle with one deck, leaving the holds clear of all obstructions. Her principal dimensions are:—Length, B.P. 290 ft.; breadth, 46 ft., and depth, moulded, 22 ft.; and the erections consist of bridge 74 ft., being available for carrying cargo if required, and topgallant forecastle for petty officers and crew. Ample water ballast is provided in the double bottom and after peak. There are four large hatchways arranged for rapid loading and discharging each worked by powerful steam winches of heavy

Liverpool type by Messrs. John Lynn & Co., Ltd., steam being supplied from multitubular donkey boiler by Messrs. Cochran & Co. (Annan), Ltd. Quick-warping steam windlass by Messrs. Emerson, Walker & Thompson Bros., Ltd., and steam steering gear by Messrs. Donkin & Co. Large spacious deck houses are situate on top of bridge deck for captain, officers and engineers, the saloon being tastefully fitted up in polished oak. The engines of the triple-expansion type are by Messrs. the North-Eastern Marine Engineering Co., Ltd., of Sunderland, having cylinders $21\frac{1}{2}$ in., 36 in. and 59 in. by 39 in. stroke, with extra large boilers of 180 lbs. pressure. During construction the vessel and machinery have been under the personal supervision of Mr. J. Boddy, of Newport, Mon.

LAUNCHES—Scotch.

Rowan.—On April 23rd, there was launched from the shipbuilding yard of Messrs. David & William Henderson and Co., Ltd., Meadowside Works, Glasgow, a handsomely modelled steamer which they have built for Messrs. Laird Line, Ltd., Glasgow, for their cross-Channel service. The principal dimensions are :—Length overall, 292 ft. ; breadth moulded, 38 ft. , depth moulded, 17 ft. 6 in. The new vessel will be the largest and most up-to-date vessel engaged in the cross-Channel trade from Glasgow, and will have superior accommodation for first and second-class passengers. Much attention has been given to the ventilation throughout the ship, and a large number of electric fans have been installed for this purpose. Both the bridge and poop decks are covered by boat decks extending to the ship's side, thus providing sheltered promenades for first and second-class passengers. The vessel has an equipment of boats and other life-saving appliances of the most modern description. A complete installation of electric light has been fitted throughout the vessel. Arrangements have been made which will enable the steamer to engage in the cattle-carrying trade in accordance with the regulations of the Irish Privy Council and Board of Agriculture. To facilitate the rapid handling of cargo special attention has been paid to the cargo gear, and the vessel has been fitted with an ample number of steam winches and cranes. The machinery, which has also been supplied by Messrs. Henderson, consists of a set of triple-expansion engines, having cylinders 27 in., 45 in. and 73 in. diameter with a stroke of 36 in., the power being supplied by four single-ended boilers working at a pressure of 185 lbs. On leaving the ways the vessel was gracefully named *Rowan* by Mrs. David Rowan, of Dunskaig, Ayr.

Baron Ogilvy.—On May 6th, Messrs. A. Rodger & Co., Port Glasgow, launched the steamer *Baron Ogilvy*, which they have built for Messrs. Hugh Hogarth & Sons, Glasgow and Ardrossan. The dimensions of the vessel are :—Length, 385 ft. ; breadth, 51 ft. ; depth, 29 ft., giving a deadweight carrying capacity of 7400 tons. The machinery will be supplied by Messrs. D. Rowan & Co., Glasgow. The naming ceremony was performed by Miss Maud Strang, Busby.

Duke of Argyll.—On May 6th, the *Duke of Argyll* was launched by Messrs. William Denny & Brothers, Dumbarton. The *Duke of Argyll* is a passenger steamer of 330 ft. Her propelling machinery will consist of three sets of turbines supplied with steam from five boilers. All the machinery is by Messrs. Denny & Co., Dumbarton. The speed of the vessel on service is guaranteed at $20\frac{1}{2}$ knots. Messrs. Wailes, Dove & Co.'s "Bitumastic" enamel was applied to the bunkers, fore and aft peaks, ballast trimming and engine and boiler-room tanks. At the luncheon Mr. James Denny presided and in proposing "Success to the *Duke of Argyll*," remarked that the turbine controversy had broken out again. While, however, the value of the new engine for certain purposes was regarded as questionable by technical writers, there was no doubt that for high speed in channel vessels it was the better. Speaking of the performances of the *Otaki*, which had completed the voyage to New Zealand and home, Mr. Denny said this vessel had made a run which, so far as economical results were concerned, corresponded to what they had promised the owners ; but his firm expected to get better results from the combination engine when they had further experience in its working.

Sin Mac.—On May 12th, Messrs. Archd. McMillan & Son, Ltd., Dumbarton, launched the steel screw tugboat *Sin Mac*, which is the second and larger of two such vessels they have built to the order of the Sincennes-McNaughton Line, Ltd., Montreal. The vessel is of the following dimensions :—Length, 138 ft. ; breadth, 26 ft. ; depth, 14 ft., and will be fitted with triple-expansion engines having cylinders $17\frac{1}{2}$ in., 28 in. and 46 in. by 30 in. stroke, supplied with steam at 185 lbs. pressure from one large boiler fitted with Howden's forced draught. The vessel has all the necessary arrangements for the quick handling of vessels under tow, including a large steam towing winch. The accommodation is of a very superior nature, the rooms being large and well furnished. Water ballast is arranged for in cellular double bottom under engine space and also in fore and aft peaks. Besides being fitted as a tugboat, the vessel will have a large salvage pump and also a fire pump. The vessel has been built to the designs and specifications and under the supervision of Messrs. John Reid & Co., of London, Glasgow and Montreal. At the launch the owners were represented by Mr. Yvon Dupré, and the naming ceremony was performed by Mrs. John Dunlop, Langside, Glasgow. After the launch the vessel was taken to Glasgow, where her machinery will be put on board by Messrs. Muir & Houston, Ltd.

Baron Napier.—On May 21st, Messrs. Napier & Miller, Ltd., launched from their yard at Old Kilpatrick the steel screw steamer *Baron Napier*, built to the order of Messrs. H. Hogarth and Sons, Glasgow, to carry fully 8,000 tons on 24 ft. with large hatches, clear holds, ten steam winches, electric light and deep ballast tank. The dimensions of the vessel are : Length, 400 ft. ; breadth, 52 ft. ; depth, 30 ft. ; with a gross tonnage of about 4,800 tons, built to the British Corporation requirements for their highest class. The machinery is being supplied by Messrs. Dunsmuir & Jackson, Ltd., and consists of triple-expansion engines having cylinders 27 in., 43 in., 72 in., with 48 in. stroke, also two main boilers and a donkey boiler.

Hydra No. 6.—On June 1st, Messrs. Wm. Simons & Co., Ltd., Renfrew, launched from their yard, with steam up, complete and ready for work, a bow-well barge-loading bucket-ladder dredger, which they have constructed to the order of Messrs. Sir John Jackson, Ltd. The dredger is named *Hydra No. 6*, and will be employed in carrying out a large port improvement contract which Messrs. Jackson have in progress at Singapore. The dredger is fitted with one set of triple-expansion surface condensing engines and one mild steel multitubular boiler constructed for a working pressure of 160 lbs. per square inch. These engines are arranged either to drive the propeller or the dredging gearing, as may be required.

Slemish.—On June 2nd, Messrs. Ramage & Ferguson, Ltd., launched a steel cargo steamer of about 2,000 tons burthen, which they have built to the order of Irish owners. The steamer was named *Slemish*.

Swansea Vale.—On June 4th, the Clyde Shipbuilding and Engineering Co., Ltd., Port Glasgow, launched a steel screw steamer 235 ft. by 36 ft. by 17 ft. 3 in., to Lloyd's highest class, for the Swansea Steamers, Ltd., Swansea, under the superintendence of Captain J. H. Donald, Swansea. The vessel was named *Swansea Vale*, and immediately after the launch was berthed in the Company's dock, to receive her machinery, which has also been constructed by the builders.

LAUNCH—Irish.

Leicestershire.—On June 3rd, Messrs. Harland & Wolff, Ltd., launched the large steel twin-screw steamer *Leicestershire*, built to the order of the Bibby Line, of Liverpool, which has long been associated with shipbuilding on Queen's Island. The new vessel is 482 ft. 9 in. long by 54 ft. $4\frac{1}{2}$ in. beam. She will have four masts, schooner rigged, and will be equipped with powerful steam windlass and winches, patent steering gear, and many novel contrivances for efficient working. She is intended to carry a large number of passengers, and ample provision will be made for their comfort, including mechanical ventilation of the state-rooms, baths and refrigerators, to ensure an ample supply of ice and fresh provisions, while the electric light will be provided throughout the ship. The *Leicestershire* will have two sets of Harland and

Wolff's quadruple-expansion engines arranged on the "balanced" principle. A noteable feature in the passenger accommodation is the arrangement of the state-rooms on the Bibby "tandem" principle, both the inner and outer state-rooms being lighted with sidelights from the outside. The advantages of this arrangement, which was first adopted in the s.s. *Warwickshire*, of the Bibby Line, are greatly appreciated by passengers.

TRIAL TRIPS.

Monkstone.—On May 17th, the first-class cargo steamer *Monkstone*, built by Messrs. Robert Thompson & Sons, Ltd., Southwick Yard, to the order of Messrs. The Rosella Steamship Co., Ltd. (Messrs. Elvidge & Morgan, Cardiff, managers), was taken to out sea on her official trial. The trial trip was successful in every respect, and Mr. Carl Morgan and Mr. Cyril Morgan, managing directors of the purchasing company, expressed themselves highly satisfied with both vessel and engines. Mr. George Clark was present on behalf of the engine-builders. Particulars of the vessel were given in our May issue under launches.

Uromi.—On May 19th, the twin-screw passenger steamer *Uromi*, built by W. Harkess & Son, Ltd., Middlesbrough, had a successful trial trip in Tees Bay. She was loaded with a full cargo of 1220 tons, which she carries on a draught of 12 ft. 3 in., and she steamed an average of 11¼ knots speed. On completion of her trials the *Uromi* proceeded on her voyage to Nigeria.

Fabius.—On May 19th, the s.s. *Fabius*, a vessel of novel type, built for service to Southern Nigeria, by Messrs. G. Rennie & Co., of Greenwich, to the order of the Crown Agents for the Colonies, was taken for steam trial, when her contract speed was fully carried out and the vessel will proceed under her own steam to Lagos. Amongst those present at the trial were Sir J. Fortescue Flannery, of Messrs. Flannery, Baggallay & Johnson, ; Mr. Shelford, of Messrs. Baker and Shelford ; Mr. T. H. N. Bonell, Captain Child, and Mr. Shield. Particulars of the vessel will be found under launches in our June issue.

Boscawen.—On May 20th, the steel screw steamer *Boscawen*, built by Messrs. Craig, Taylor & Co. Ltd., Stockton-on-Tees, to the order of Messrs. E. Jenkins & Co., Cardiff, was taken to sea for her trial trip, which proved highly satisfactory. During the whole of the trip everything worked with the greatest smoothness, and over a series of runs between Hartlepool Heugh and Redcar Buoy a speed of 11¾ knots was maintained. After the trial trip the vessel proceeded to Cardiff under command of Captain Lewis. The reader is referred to our May issue of launches for further particulars of the boat.

Morien.—On May 20th, the steel screw steamer *Morien*, built by Messrs. Robert Thompson & Sons, Ltd., at their Southwick Yard, to the order of C. M. Burchell, Esq., of Sydney, Cape Breton, Nova Scotia, was taken out to sea on her official trial. She is built to take the highest class at Lloyd's, her principal dimensions being :—Length B.P. 215 ft. ; breadth, 31 ft. 6 in. ; depth moulded, 14 ft. 8 in. The erections consist of cargo poop, bridge and top-gallant forecastle for crew. Ample water ballast is provided in double bottom and fore and after peaks. There are three large hatchways arranged to make the vessel perfectly up-to-date as a self-trimmer, and arranged for rapid loading and discharging of cargo, the steam winches being supplied by Messrs. John Wigham & Son. In addition to the usual derricks, gaff derricks are fitted for each hatch. Steam windlass has been supplied by Messrs. Emerson, Walker and Thompson Bros., Ltd., and steam and hand-steering gear by Messrs. John Rogerson & Co., Ltd. The engines of the triple-expansion type are by Mr. Geo. T. Grey, of South Shields, having cylinders 16½ in., 27 in. and 44 in. by 30 in. stroke, steam being supplied by two large boilers working at a pressure of 180 lbs. per square in. The trial trip was successful in every respect, and Captain Burchell expressed himself highly satisfied with both vessel and her machinery.

Howden.—On May 20th, the new self-trimming collier *Howden*, specially built by Messrs. Osbourne, Graham and Co., to the order of Messrs. Furness, Withy & Co., Ltd., for their collier trade, made her official trial trip. A large company was present. The vessel was described in our launches for June. A Cochran (Annan) donkey boiler with patent seamless furnace has been supplied and fitted.

Turrialba.—On May 21st, this new steamer left Messrs. Workman, Clark & Co.'s outfitting berth at the Alexandra Wharf, Belfast, and after adjustment of compasses in the Carrick Roads proceeded on her speed trials on the measured mile. The tests, consisting of a series of runs over the course, were successfully carried out, an average of speed 14¾ knots being easily secured. During the trials the auxiliary machinery, refrigerating, heating and electric plants were also tested, the vessel and her equipment throughout giving the utmost satisfaction to all concerned. After the trials the vessel returned to Belfast Harbour to take in bunker coal and stores necessary for her run out to the West Indies. Further particulars of the vessel are given in our May issue of launches.

Dania.—On May 22nd, the s.s. *Dania*, lately launched by Messrs. Short Brothers, Limited, left the Wear for her official trials. The vessel, which has been built to the order of the Société Anonyme D'Armament Belge Gantoise, Ghent, is over 260 ft. long and carries a cargo of 2,700 tons deadweight. She takes the highest class of Germanischer Lloyd, and is specially designed with clear holds and large hatches for the timber and coal trades. On the trial runs the vessel maintained a speed of 11 knots. A Cochran (Annan) donkey boiler with patent seamless furnace has been supplied and fitted. Amongst those present at the trial trip were Mr. Nolson, Mr. P. J. Goetbloet, and Mr. Fleming. Further particulars of the boat will be found in our June issue of launches.

Broomhill.—On May 25th, the steel screw steamer *Broomhill*, built by Messrs. Irvine's Shipbuilding & Dry Docks Co., Ltd., West Hartlepool, to the order of Messrs. The Broomhill Collieries, Ltd, Newcastle-on-Tyne, proceeded on her official trial trip in Hartlepool Bay. Particulars of the vessel will be found in our list of launches. During the trial the engines and auxiliary machinery worked most smoothly, a speed of 10 knots being obtained. The owners were represented by Messrs. H. Coates, Graham and Tose ; the shipbuilders by Mr. J. B. Roberts ; and the engine-builders by Mr. G. Urquhart. A Cochran (Annan) donkey boiler with patent seamless furnace has been supplied and fitted.

Rossano.—On May 26th, the handsome steel screw steamer *Rossano* was taken from the yard of Messrs. Wm. Gray and Co., for her trial trip. The vessel has been built for Messrs. Furness, Withy & Co., Ltd., of West Hartlepool, and her particulars will be found in our June issue of launches. The trial was satisfactory in all respects, a mean speed of 10½ knots being obtained. Mr. A. H. Walker and Mr. T. Tose were present on behalf of the owners. After the trial the vessel proceeded to Middlesbrough to load.

Webburn.—On May 27th, the s.s. *Webburn*, built by Messrs. W. Harkess & Son, Ltd., of Middlesbrough-on-Tees, was taken for her official trial trip in Tees Bay, when everything worked to the entire satisfaction of the owners, and a mean speed of 10¾ knots was obtained upon a one hour's run. The vessel is built to the order of Messrs. Whiteway & Ball, of Torquay, and is specially designed for their East and South Coast coal trade, and she loaded a cargo of 1,100 tons, in Hartlepool, before proceeding. The engines are of 600 I.H.P., and have been built by Messrs. Richardsons, Westgarth & Co., Ltd., of Middlesbrough. A Cochran (Annan) donkey boiler with patent seamless furnace has been supplied and fitted.

S.S. Ambiorix.—On May 31st, the s.s. *Ambiorix*, built by Messrs. Wm. Pickersgill & Sons, Ltd., of Southwick, Sunderland, to the order of the Antwerpsche-Zeevaart-Maatschappij Co., Ltd. (Messrs. J. D'Haene & Co.), Antwerp, left their yard for her trial trip. Particulars of the boat will be found in our launches. The trial trip was entirely successful, the machinery giving a speed of 12 knots on the measured mile. The owners were delighted with the steamer and the satisfactory results obtained. They were represented by Messrs. Brys, Van der Weilen, Vogt, and a party of friends ; the engineers by Mr. MacColl ; and the builders by Mr. Wm. Pickersgill, Senr., and Mr. Wm. Pickersgill, Junr. After trial trip the steamer proceeded to Blyth for bunkers, after which she goes to the White Sea under the command of Capt. Franz Palm.

BOARD OF TRADE EXAMINATIONS.

Extra First Class.

1909.
May 8th—Barnes, W. F. .. .. Ex 1C London
8th—Blenkinson, J. F .. Ex 1C N Shields
8th—[illegible], A. W. . Ex 1C N Shields
8th—[illegible], J. H. .. Ex 1C N.Shields
8th—Runciman, C. .. Ex 1C N Shields
8th—Shott, G. N. .. . Ex 1C Liverpool
8th—Taylor, E. .. .. Ex 1C London
26th—M'Neil, P. E. . .. Ex 1C London

NOTE—1C denotes First Class; 2C Second Class.

May 1st, 1909.

Andrew, J. .... 1C Greenock
Axtens, F. W... 2C Bristol
Banyard, F. R. 2C London
Baxter, H. W. H. 2C Liverpool
Bell, D. J. .... 2C Greenock
Black, D ...... 1C Greenock
Black, J. D. .. 1C Liverpool
Blyth, H. .. . 1C Hull
Brown, J. .... 2C Greenock
Campbell, N. .. 2C Greenock
Crawford, W.C. 1C Greenock
Doxford, E. R. 2C Sunderl'd
Dodd, U. H. .. 2C Sunderl'd
Earl, G. . .. 2C Sunderl'd
Fitzakerly, S. J. 1C Sunderl'd
Halliday, F. .. 1C Sunderl'd
Henshaw, A. H. 2C London
Humphrey, T. 2C London
Huntress, T. J. 1C N Shields
Kemp, Alex. .. 1C Liverpool
Leathley, J. H 2C N.Shields
Lobb, C. ...... 2C London
Love, J. H. .. 2C London
M'Arthur, A. .. 2C Greenock
McColl, R. F... 1C Greenock
M'Donald, J.Y. 2C N.Shields
Mason, J. A. .. 1C N Shields
Murdoch, A. .. 2C Greenock
Noel, T. J. .... 2C Liverpool
Payne, G. W... 1C Liverpool
Rae, A. E. .... 1C Greenock
Ross, W. J. R. 2C London
Salmon, H. E. 2C Sunderl'd
Scott, M. F. .. 2C L'nderry
Searle, W. R... 1C Bristol
Seymour, R. W. 2C London
Shaw, A. ...... 1C Aberdeen
Smith, H. K. .. 1C Bristol
Smith, W. C... 1C Aberdeen
Sowerby, J. M. 1C Liverpool
Spears, F.G.W. 2C Sunderl'd
Stevenson, R. L 2C London
Stewart, D. .... 1C Greenock
Templeman, R.J. 2C Liverpool
Vickermann, C 1C Hull
Woollard, C. S. 2C Liverpool

Froude, D. G 1C Cardiff
Fyfe, D. ...... 2C Leith
Gardner, A. J 2C Cardiff
Hamilton, J. .. 1C Glasgow
Harvey, C. E. 1C N.Shields
Hawley, W. P 2C N Shields
Hayler, G. D. H. 2C London
Henderson, W. H 1C Glasgow
Hobb, A. ...... 2C Leith
James, R. D. .. 2C Belfast
Jewels, J. R. .. 1C N Shields
Lewis, J. ...... 2C South'ton
Liddell, A. J. .. 1C Leith
Luke, T. E..... 1C Cardiff
M'Feat, W..... 2C Glasgow
M'George, P. .. 2C Glasgow
M'Innes, J..... 2C South'ton
M'Larty, J. A. 1C Glasgow
Mordecai, D. J. 2C Cardiff
Paisley, F. T. ... 1C London
Peel, T. B. .... 1C N.Shields
Phillips, E. M. 1C London
Pugh, W. J. .. 2C Cardiff
Russell, D. C... 2C Glasgow
Scatchard, O. S. 2C N.Shields
Sharp, R....... 2C Glasgow
Smartt, S. J. L. 2C London
Smith, W. J. .. 2C Glasgow
Stephenson, J. 1C Glasgow
Sturgeon, H. F. 2C Belfast
Thorn, E. R. .. 1C Cardiff
Ward, E....... 1C N.Shields
Watson, P.S.O. 2C N.Shields
Watt, J. F. .... 2C Glasgow
Wright, T. .... 2C Belfast

May 8th.

Allison, W. . . 2C Leith
Anderson, T. .. 1C Glasgow
Bean, T. J. .... 2C Belfast
Bennett, C. .... 1C London
Boys, B. O..... 2C Cardiff
Brown, J. .. 2C Glasgow
Campbell, A. P. 1C Belfast
Campbell, J. A. 1C Glasgow
Chalmers, A. .. 1C Glasgow
Clarke, H. S. .. 1C Cardiff
Dalgleish, T. .. 2C Leith
Driver, W. J... 2C N Shields
Duncan, R..... 1C Leith
Ellis, J. L. .... 2C N.Shields
Fairley, J. W... 1C London
Feeney, S. .... 2C Belfast
Ferrier, T. D... 1C N.Shields
Fowler, W. P. 2C N.Shields

May 15th.

Blower, A. H.... 1C Liverpool
Bottomley, L. J. 1C N.Shields
Cooper, G. .... 1C Liverpool
Davies, G. H... 1C Liverpool
Edridge, C. E. 2C Greenock
Greenaway, W. 2C Liverpool
Grossomanidis, C 1C Hull
Howes, R. W. 2C London
Jones, M....... 2C Liverpool
Laing, J. ...... 1C Greenock
Lane, W. R. .. 1C N.Shields
M'Clay, T. .... 2C Liverpool
M'Laren, A. .. 2C Dundee
Massey, C. W. 2C London
Miller, W. .... 1C Greenock
Munn, P. F. .. 2C Greenock
Phillipson, H.C. 2C Liverpool
Rea, J. R. .... 1C Hull
Russell, A. .... 2C Greenock
Sandison, R. A. 2C London
Scrimgeour, W. 2C Dundee
Sharpe, A. G... 1C Liverpool
Sime, A. G..... 2C Dundee
Latham, A. . .. 1C Liverpool
Whitehead, H.S. 2C Hull
Wing, J. ...... 2C Hull

May 22nd.

Baxter, J. .... 1C N.Shields
Bearpark, M. .. 2C W. Hart'l
Brown, W. E. 2C N.Shields
Candlish, J..... 2C Glasgow
Cocke, J. E. .. 1C N.Shields
Costain, G. M. 2C Liverpool
Crawford, E. O. 1C W. Hart'l
Davies, D. J. .. 2C Liverpool
Dawson, H..... 2C London
Defty, R. ...... 1C London
Evans, J. ...... 2C Liverpool
Finch, F. E. .. 2C N Shields
Flucker, G. .... 2C Leith
Foster, W. H... 1C Liverpool
Fullerton, J. H. 2C Glasgow
Gibson, W. J... 2C Glasgow
Gorman, E..... 2C Glasgow
Gould, W. C... 1C Cardiff
Griffiths, J. W. 2C London
Gusworth, G. F. 1C Cardiff
Hall, H. ...... 1C Liverpool
Hand, W. .... 1C South'ton
Hardy, E. .... 2C N.Shields
Harding, A. J. 2C London
Heney, W. J. .. 2C Cardiff
Higginson, F.W. 2C London
Hollins, E. .... 1C Liverpool
Hume, J. ...... 2C Glasgow
Hunter, G. W. 2C N Shields
Jackson, J. S. .. 2C W. Hart'l
Jamieson, R. .. 1C Leith
Johnstone, J. H. 2C Liverpool
Kane, G. ...... 2C W. Hart'l
Keith, J. T. .. 2C London
Kell, G. W..... 1C N Shields
Kelso, E. ...... 2C Barrow
Kinnon, J. H. .. 2C Glasgow
Livesey, N..... 2C N.Shields
Lund, B. W. .. 2C Cardiff
M'Culloch, A. J. 2C Cardiff
M'Intyre, R. L. 2C Liverpool
M'Kay, R. C. .. 2C Leith
M'Millan, J. M. 1C Liverpool
Maxwell, J. E. 1C W. Hart'l
Mercer, R. .... 1C South'ton
Miller, J. ...... 1C Glasgow
Milne, T. A. .. 2C Glasgow
Morton, T. B... 1C Liverpool
Murray, D. W. 2C Cardiff
Owen, R. .... 1C Liverpool
Pakenham-Walsh,
R. M. 2C Liverpool
Parsons, F. A. 2C South'ton
Penkeyman, S. 2C Liverpool
Popham, H.E.F. 1C Cardiff
Ramsay, J. N. 1C Glasgow
Ritchie, W..... 2C W. Hart'l
Robinson, J. E. 2C W. Hart'l
Selby, W. A. L. 1C Cardiff
Smith, W. C. .. 2C Glasgow
Stewart, J. M'G 2C London
Taylor, G. D... 2C N.Shields
Wall, J. ...... 2C Liverpool
Ward, T. ...... 2C Glasgow
Westhorpe, H.E. 2C Liverpool
Williams, R. E. 1C W. Hart'l
Willison, W. .. 2C Glasgow
Willshear, F. E. 2C London
Yates, G. ...... 2C Cardiff

May 29th.

Atkinson, C. S. 2C N.Shields
Borthwick, G... 2C Greenock
Brown, R. M... 2C N.Shields
Call, H. ...... 2C London
Cameron, W. .. 2C Aberdeen
Carr, R. ...... 1C Sunderl'd
Cavens, W.... 1C Greenock
Christie, G. P. 2C Aberdeen
Dewsbury, P.W. 2C London
Elphick, H. W. 2C London
Gebbie, M. J... 2C Liverpool
Griffiths, N. .. 2C Bristol
Houston, D. C. 2C Greenock
Howlett, E. T. 1C N.Shields
Inglis, P....... 1C Greenock
Irvine, W. J. .. 1C Sunderl'd
Jenkins, G. E. 2C Bristol
Kay, C. A. .... 2C Hull
Kenny, T. H... 2C Liverpool
Leitch, C. .... 1C Greenock
Lodge, G. .... 2C Hull
M'Laughin, W. 2C Liverpool
Maid, J. M. .. 2C Sunderl'd
Mankin, T. H. 1C N.Shields
Mellick, F. .... 1C London
Miller, H. F. .. 2C N.Shields
Milne, E. W. .. 1C Aberdeen
Mitchell, R. .. 2C Aberdeen
Moore, J. W. .. 2C Sunderl'd
Parker, F. B. .. 1C Hull
Raines, G. .... 2C N.Shields
Risoglou, P. .. 2C N.Shields
Sanchez, J. .... 2C Liverpool
Smith, H. .... 2C Aberdeen
Tawse, W. J. .. 2C Aberdeen
Teasdale, J..... 2C N.Shields
Todd, D. ...... 2C Liverpool
Wade, J. H. .. 1C Hull
Wood, H. W. 1C Aberdeen

June 5th.

Anderson, J. B. 2C Glasgow
Andrew, J. M. 1C Glasgow
Atkin, B ...... 2C Liverpool
Bailey, T. A. L. 2C Liverpool
Baker-Gabb, D. 1C Glasgow
Blakey, H. .... 2C N Shields
Bromfield, J. R. 1C London
Buchanan, A. D. 1C Glasgow
Buglass, D. T. 2C N.Shields
Campbell, A. .. 2C South'ton
Campbell, R. R. 2C South'ton
Carrick, W. L. 1C Leith
Charles, G. B... 1C Glasgow
Cleave, R. H... 2C Falmouth
Coulter, J. T. .. 2C London
Cubbin, W. G. 1C Liverpool
Cunningham, W. 2C Glasgow
Davies, E. .... 1C Cardiff
Defty, H. M. .. 2C N Shields
Dorey, G. T. .. 2C London
Driver, J. W. .. 1C N.Shields
Eaton, J. ... .. 2C Belfast
Fletcher, A. .. 2C Leith
Gibbin, J. J. .. 2C Glasgow
Gifford, A. C. .. 2C Cardiff
Grey, G. H. .. 2C N Shields
Govan, F. M'K 1C Belfast
Howison, F. .. 2C N.Shields
Howlett, J. .... 2C Liverpool
Hughes, C. H. 2C Falmouth
Hyndman, D.M. 2C Glasgow
Jones, D. E. .. 1C Cardiff
Jones, F. S..... 1C Cardiff
Kirkland, J..... 1C Liverpool
Mackenzie, T.G. 2C Liverpool
M'Keller, T. S. 2C Glasgow
M'Laren, A. G. 2C Glasgow
M'Lellan, J. G. 2C Glasgow
Meggitt, A. H. 1C Liverpool
Metcalf, H..... 2C N.Shields
Naismith, A.W.B. 2C Leith
O'Kane, W. J. . 2C Liverpool
Palmer, E. T... 2C South'ton
Petrie, J. A. .. 2C N.Shields
Priestley, P. W. 2C London
Pritchard, J. J. 1C Belfast
Rankin, E. W. 1C Liverpool
Ross, C. S. .... 1C Glasgow
Ross, W. ...... 2C Glasgow
Stancombe, G. B. 2C Glasgow
Thompson, W.M. 2C N.Shields
Thomson, G.H.S 1C Leith
Titjen, M. G. .. 2C London
Wheatley, S. .. 2C Glasgow
Whitfield, W.H. 2C N.Shields
Wyllie, J....... 2C Glasgow

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